COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

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New York, September, 1932

Where Responsibility Lies

BUSINESS and financial sentiment has shown a remarkable upturn in recent weeks. Starting with the end of the gold outflow, which was completed without, as many had feared, abandonment of the gold standard, jittery bankers and industrialists began to crawl out of their shell holes, and Wall Street, prodded in the first instance by foreign investors who know a bargain when they see it, decided it might be safe after all to cancel the call for the mortician. Clearer understanding of the purpose and effects of the national legislative and administrative first-aid program since the interment of the New Era has further stimulated optimism.

Admirable as the Washington program has been, cheering as the change in sentiment is, responsibility for ultimate sound business recovery rests upon the individual industrialist—and that responsibility cannot be discharged by continued injections of embalming fluid to preserve an unlovely state of business moribundity. All the efforts of government and private agencies to encourage the expansion of credit can make little headway if business, particularly in the capital goods line, which has borne the brunt of the depression, will not show faith in itself and in its future by using the facilities placed at its disposal.

Based on the average annual investment in new capital goods for 1919 to 1929, since the depression there has been an accumulated deficit in these purchases which now totals $6,300,000,000. In the coal-mining industry, at least $375,000,000 might profitably be invested in modernization to reduce costs and improve quality without necessarily increasing productive capacity. Launching such a program of capital investment would immediately stimulate activity in the production of capital goods and, since manufacturers of capital goods are among the major consumers of coal, also directly increase the demand for coal.

Government, outside of public works, cannot create business; it can only smooth the way for business to do that job. Washington has labored long, hard and with measurable success to clear the débris of the New Era from the road to recovery. The responsibility now rests on business to carry on.

Ring Down the Curtain!

RATIFICATION of wage agreements by a referendum vote of the rank and file of the workers affected by the proposed contract has long been accepted as an integral part of the wage-making machinery in the unionized coal fields of the country. In theory, of course, the referendum is assumed to be the quintessence of democratic control. Experiences with referendum ratification the past few months in Illinois and the Far West, however, have been such as to raise serious questions both as to whether this theory works out in practice and as to whether this venerable institution has outlived any usefulness it may have had when it was first instituted.

When the union delegates the negotiation of an agreement to its scale committee, it is, or should be, a natural presumption that the representatives selected to serve on that committee have the confidence of their membership. This scale committee meets with a committee chosen by the operators. The only difference between the two committees is that the representatives of the operators have full power to act and their action is binding upon the producers who selected them. Why, in the democ-

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racy of organized labor, should the union scale committee have less authority? Why should the union reserve to itself the right to repudiate the action of its own representatives in the task for which they were specifically chosen? Would they want the authority of the operators' committee similarly circumscribed?

As long as ratification was a *pro forma* motion it was accepted as a gesture which delayed but did not jeopardize the work of the joint scale committee. But when, as has happened recently, leather-lunged minorities with no intimate knowledge of the industrial background of the contract can imperil an agreement because a substantial percentage of the membership does not take the trouble to vote, the democratic theory of the will of the majority loses its weight. When, as in southern Wyoming, union officials feel impelled to repudiate an adverse referendum in which less than 80 per cent of the men voted, in order to give effect to the will of the majority of the workers involved, the hollowness of ratification by referendum as a democratic instrument is so plain that it seems high time to ring down the curtain on the venerable farce.

Make Middlings Pay

CLEANER COAL in the commercial market is attained only by leaving more coal of mediocre quality at the mine. Loss of such coal puts a heavy burden on the operator. In many cases, however, he could escape this burden by using the middlings to generate his own power. When this is done, the operator can well afford to clean his output to a degree that would be wasteful were no outlet found for the less desirable coal.

Demand for clean coal is growing and will continue to grow because of high freight rates, cost of ash removal, increasing objection to fly ash and sulphur, need for high rating of boilers to conserve valuable space in congested industrial centers, and the recognition that only clean coal gives the highest efficiencies. Almost all utility engineers are striving to obtain the largest kilowatt-hour output per pound of coal. Consequently the clamor for cleaner and yet cleaner coal.

Under these conditions, lower and lower gravity separation is likely to rule and more and more coal will go to the waste dump unless another place is found for the middle product. Those who have the equipment to utilize this product at their mines will be able to meet the situation; those that cannot, face almost certain defeat in the competitive struggle.

Practical Cooperation

PULVERIZED COAL is the most economical and satisfactory fuel for use in heavy forging and metallurgical furnaces, declares the Norfolk & Western Railway, after a series of comparative tests with oil, coal gas and stoker-fired coal at its Roanoke shops. This announcement, coming at a time when so much is being said in favor of oil- and gas-fired furnaces, marks another in the impressive list of practical contributions made by this carrier to the support of the mines served by its lines. Included in that list are the establishment of specialized coal bureaus with a scope and functional conception far beyond that of the routine off-line traffic agency; an engineering study to determine the adaptability of N. & W. coals to the domestic stoker, initiated when some producers were fearful that the entrance of that equipment into the family cellar threatened their markets; and a consistent advertising campaign to bring the merits of N. & W. coals to retailers and industrial consumers. Cooperation such as this, since duplicated in part by a few other coal-carrying railroads, deserves still wider emulation.

Money for Comfort

ALTHOUGH THE DEPRESSION of the past three years has made penny pinching almost a necessary virtue, the average citizen is still interested in comfort and convenience and is still ready and willing, within the limits of his depleted resources, to spend his money to buy them. During the first half of the current calendar year, for example, the number of small stokers (equipment with a capacity of 100 pounds or less per hour) sold showed a decline of only 7.35 per cent from the number reported for the corresponding period in 1931. The clairvoyance of the seventh son of a seventh son is not required to visualize what that forecasts when financial skies are brighter.

MODERNIZATION PROVES

+ A Real Cost-Cutting Tool

At West Virginia Coal & Coke Mines

By IVAN A. GIVEN

Assistant Editor, Coal Age

MODERNIZATION in the hands of a forward-looking management is a real cost-cutting tool, the West Virginia Coal & Coke Corporation has found. By eliminating two-thirds of the mines in operation ten years ago, and through the rehabilitation of mining properties, equipment and methods in recent years, the company was able to show, after adjustment for a wage reduction late in the year, a net saving of 11.6c. per ton in expenditures for labor, supplies and power in the Logan division in 1931, as compared with the cost in the preceding year. Total saving, including the wage reduction, was 15.5c. per ton in 1931.

While the company also operates in central West Virginia and in the Elkins field, the Logan division, with operating headquarters at Omar, W. Va., is by far the most important and accounts for practically all of the production at the present time. Six mines in this division produced a total of 2,475,536 tons in 1931 and 2,770,670 tons in 1930. A seventh (Micco) will be added to the list upon completion of the present reconstruction program, which includes the building of a modern tipple.

In general, the West Virginia Coal & Coke modernization program was predicated on the utilization, where possible, of existing machinery, with changes to make it conform to present-day operating standards. This was particularly true of substation equipment and rolling stock. Purchases were confined to equipment which was not already available or could not be rebuilt in accordance with the new standards, such as track material, fans, pumps, substation control equipment, rock dumps and refuse disposal machinery, sectionalizing circuit breakers, trolley supplies, and preparation equipment. Additional investments covered driving a rock tunnel, sinking an airshaft, and other construction jobs.

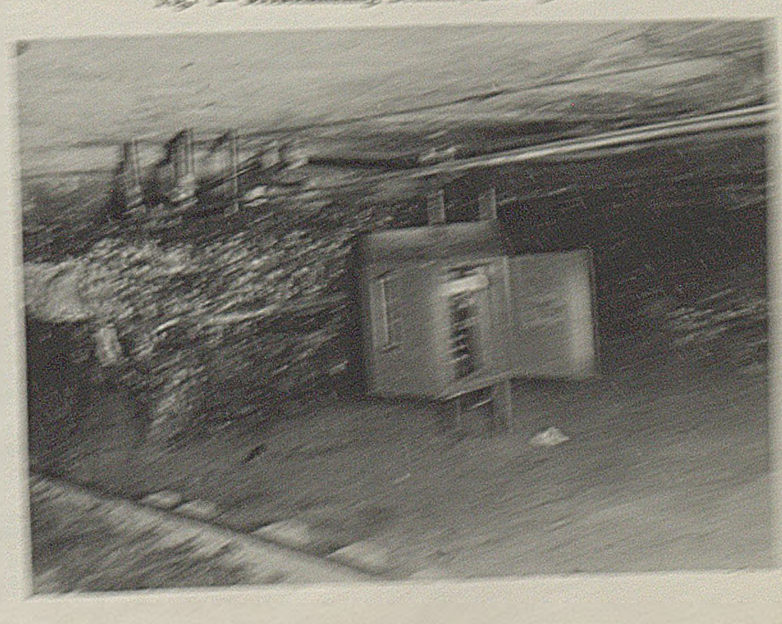
Major capital expenditures in the past two years are given in Table I. While this tables does not include all capital expenditures made in those years, it sets forth the principal items.

Relocation of the substations, a major feature of the electrification program, was started early in 1931. By mines, these changes were: No. 5—Pine Creek substation rebuilt with a 200-kw. unit; old 150-kw. unit moved underground; both stations looped in with 400-kw. station at drift mouth; No. 4—moved one of the two 200-kw. units to new location nearer load center; No. 19—old substation dismantled and three new ones built, one (200-kw.) near center of work in No. 19 mine, one (200-kw.) underground near No. 18 mine, and one (300-kw.) near drift mouth, primarily to handle long haul on outside tramway; Micco—moved 200-kw. station inside near load center; Rossmore—built new 200-kw. underground station to supplement 400-kw. outside station; Earling—moved Earling station (two 150-kw. motor-generator sets) underground near load center.

All underground stations are of fireproof construction and are equipped with individual ventilating and cooling blowers. Except for motor-generator sets at Earling and No. 5, rotary converters are used. Earling, Rossmore, Micco, No. 5 and No. 19 stations are equipped with Westinghouse full-automatic controls. Other stations are automatic on the d.c. side only.

The Earling underground station differs from the rest in that the automatic control system provides for the operation of either one or both of the motor-generator sets, depending upon the load

Fig. 1—Sectionalizing Breaker, Earling Mine



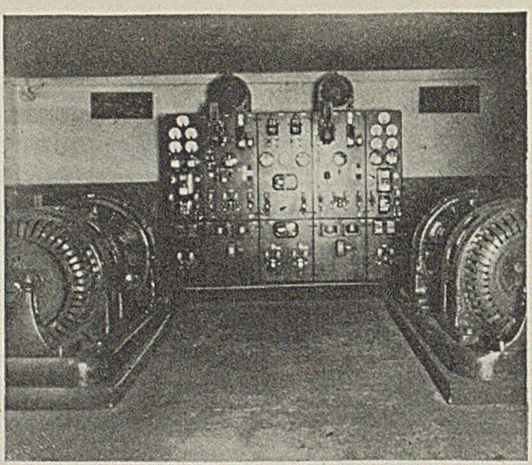


Fig. 2—Underground Substation, Earling Mine; Two 150-kw. Motor-Generator Sets; Full-Automatic Control

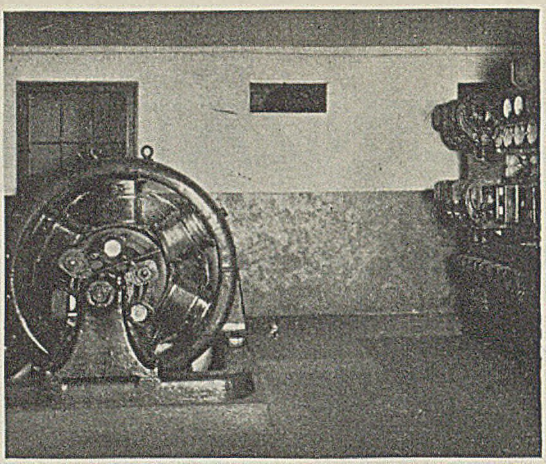


Fig. 3—Underground Substation, Rossmore Mine; 200-kw. Rotary Converter; Full-Automatic Control

conditions in the mine. Normally, one set runs continuously, but in case the load exceeds its capacity for 2 minutes, the second unit starts, coming up to speed in 15 seconds. After the excess load disappears, the second set continues to run for 20 minutes before it is automatically shut down.

Aside from the Earling mine, all operations, both surface and underground, are served by the company's private transmission system. Current is purchased, and enters the company's lines at Omar, where a 3,000-kw., 6,600-volt central metering and switching tower is located. Further voltage reduction varies. For part of the mine, surface and lighting loads, the voltage is reduced to 2,300 and then to 110, 220 or 440, while at other points reduction takes place in one step from 6,600 volts.

In all but one case, underground substations are served with high-tension a.c. current through Parkway cables. These are either buried in trenches cut in the floor or are fastened by wooden wedges in slots cut along the ribs by arcwall machines. Drilling expense dictated this method of connecting up underground stations, rather than boreholes.

Except for No. 15, Logan division mines have been equipped with 23 automatic sectionalizing circuit breakers. General Electric, Automatic Reclosing Circuit Breaker Co. and Westinghouse breakers are used. These automatically disconnect the section when overloads occur, and also automatically reconnect the line after a definite time interval, provided load conditions are normal. With these breakers set properly, abnormal loads cannot interrupt service from the substations.

Starting in 1926, mine officials began systematically replacing the old 4-0 trolley wire with 6-0, with the result that 6-0 wire is now in place on all main-line haulways, and in most of the working sections. Main-line construction underground embodies the use of Ohio Brass combination hangers to carry both feeder and trolley wire. Outside trolley construction is shown in Fig. 4, a view of the outside tramway at No. 19 mine. All of the substations at the seven mines have been connected by a 500,000-circ.mil feeder line.

Revision of the mine power system has resulted in a marked decrease in the quantity of feeder line used, and in an even more striking betterment of voltage conditions. Location of the stations near load centers and improvement in transmission systems has reduced to 15 to 25 per cent the maximum drop from the rated d.c. voltage of 275. In the old days, voltages as low as 160 frequently were encountered at the ends of long trolley lines, and 180 volts was quite common.

Table I—Major Expenditures in the Modernization Program of the West Virginia Coal & Coke Corporation

Electrification	
New substations; rebuilding and relocating old substations:	
No. 5 Mine	$16,000
No. 4	9,000
No. 19	23,000
Micco	7,500
Rossmore	8,900
Earling	12,500
Sectionalizing breakers, all mines except No. 15	16,100
Total	$93,000
Haulage	
New cars (500)	$90,000
Timken bearings (650 sets)	35,750
10-ton locomotive, No. 19	6,900
Tandem locomotive, No. 5 (assembled by company)	5,500
Main haulage tracks, No. 5, No. 19, Micco	36,000
Rock tunnel, No. 5	13,500
Total	$187,650
Cutting	
Two slabbing machines, No. 5	$20,000
One arcwall machine, No. 19	8,600
Total	$28,600
Ventilation	
Fan and airshaft, No. 19	$30,000
Fan, No. 15	17,000
Fan, No. 5	17,000
Total	$64,000
Pumping and Drainage	
Underground pumping station, including ditching and pipe, Rossmore	$9,000
Maintenance and Repairs	
Repair shop, No. 5	$15,000
Preparation	
Air-cleaning plant, No. 5	$45,000
Micco tipple	40,000
Total	$85,000
Refuse Disposal	
Aerial tramway, No. 5	$55,000
Aerial tramway, Rossmore	10,000
Hillside slate dump, Earling	4,000
Total	$69,000
Grand Total	$551,250

Revamping of the entire haulage system at No. 5, No. 19 and Micco mines led off the transportation program. Shortening of the haul was the primary object at Nos. 5 and 19. To accomplish this purpose at No. 5, a new 7x12-ft. rock tunnel, 900 ft. long on a 3 per cent grade against the loads, was driven to shorten the haul one mile. The work was done by the company and, where roof conditions were bad, the tunnel was lined with semicircular steel sheathing (Commercial Shearing & Stamping Co.) supported on concrete sidewalls (Fig. 5). No. 19 improvements consisted of relaying main-line tracks and the construction of an outside tramway (Fig. 4) to shorten the haul to the tipple three-quarters of a mile. At Micco, no new haulways were constructed, but a system of high-grade tracks was built up.

Main haulage tracks at Nos. 5 and 19 were relaid with 60-lb. steel on 6x8-in. creosoted ties, using gravel and slag ballast. The creosoted ties cost $1.45 each, against 45c. each for the old, slightly smaller, untreated ties with a life of 4 years. Treated ties are expected to yield an ultimate saving of $3.40 each at the end of 16 years. Micco 45-lb. steel was replaced with new 60-lb. rail on creosoted ties with gravel and slag ballast.

Clean-up activities are considered by West Virginia Coal & Coke officials to be necessary adjuncts to the maintenance of haulage roads. All refuse is loaded out of main haulways, and they are thereafter cleaned up at stated intervals. Refuse on secondary haulage roads may be loaded out, but usually is stacked

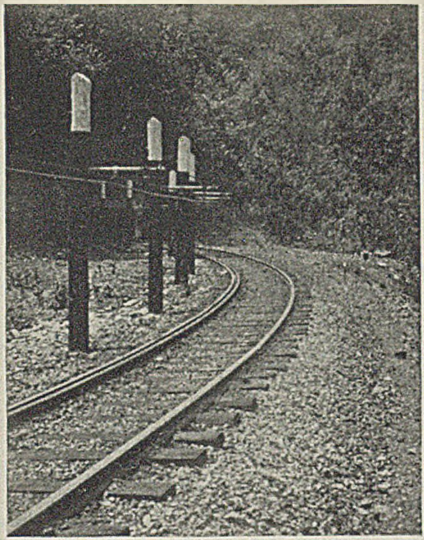


Fig. 4—Outside Tramway at No. 9 Mine. Fan Control Box Is Attached to Mine Portal

along one side of the entry, leaving a clear space of 4 ft. between the refuse and the rail. Timbers are set along the outer edge of the stacks. Room refuse is gobbed along one side of the room, as on the secondary haulways, and stacks are paralleled by timbers in the same manner.

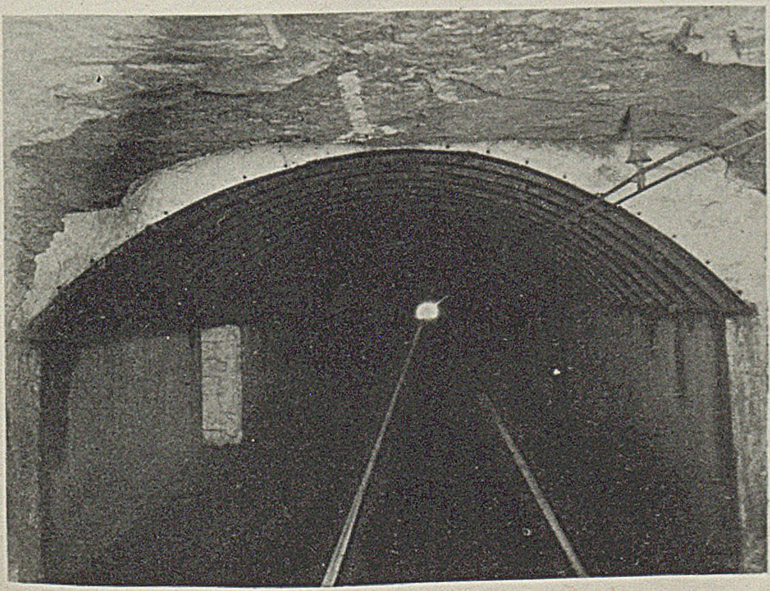
One of the principal features in the modernization of haulage roads was the construction of sidetracks convenient to the working sections. The company now insists on sufficient sidetracks to cut down the maximum haul of any gathering locomotive to 1,800 ft. Individual sidetracks may serve more than one section, the average distance between them being approximately 1,000 ft., but the above limitation on length of gathering haul is strictly observed.

Primarily as a result of revamping haulage to enable gathering locomotives to work at the greatest possible efficiency, gathering performance has been materially increased. Major projects involving construction of new haulways and tracks or changes in motive power were completed late in 1931. In August of that year, the number of loaders per locomotive was 11.2, and the average cars gathered per motor per day was 47. In March, 1931, each locomotive was serving an average of 15.8 loaders and was gathering an average of 70 cars. During this same period, the tonnage per loader per day rose from 12.7 to 13.3.

Improvements in rolling stock were not neglected in overhauling transportation. Five hundred new, composite-type, Timken-equipped, Brown-Fayro mine cars, capacity 106 cu.ft., have been purchased in the past eighteen months to replace old 92-cu.ft. plain-bearing cars. In addition, 650 sets of Timken bearings have been installed under such of the old-type cars as were susceptible to salvage. A new 10-ton Westinghouse haulage locomotive was purchased for No. 19 mine, while No. 5 mine was equipped with a 20-ton tandem locomotive, built up from 10-ton Baldwin-Westinghouse units by the company at a cost of $5,500. All other locomotives, both gathering and main-line, have been rebuilt. This rebuilding included changing the Jeffrey and Goodman gathering locomotives from 6-7 m.p.h. to 4 m.p.h. Changes in speed or rebuilding were accomplished during the regular overhauling periods, which occur every six months. As the final touch in overhauling, gathering locomotives are painted machinery blue with crimson trimmings, while main-line locomotives are coated with aluminum paint.

By making the task of gathering and haulage locomotives easier, and thus increasing the number of cars handled per shift, and by improvements in rolling stock and tracks, the West Virginia Coal & Coke Corporation cut its haulage cost from 10c. per ton early in 1931 to 8c. per ton early in 1932.

Fig. 5—Rock Tunnel at No. 5 Mine, Showing Use of Steel Sheathing



Making Modernization Effective

Without officials alive to its possibilities, modernization loses much of its force. At the West Virginia Coal & Coke operations, however, modernization is being made to yield its greatest fruits through the wholehearted efforts of the official family under the direction of Lafayette Tuck, general superintendent; Thomas A. Stroup, chief engineer; and W. H. Cooke, chief electrician.

Ventilation also came in for its share of overhauling in the rehabilitation program. New Jeffrey fans were installed at No. 5 (100,000 cu.ft. per minute) and No. 15 (118,000 c.f.m., 1-in. water gage). Perhaps the most sweeping revisions, however, were in the ventilation system at No. 19 mine. Improvements at this mine included the installation of a new two-speed, remotely controlled Jeffrey fan and the sinking of a 14x16-ft. airshaft, 90 ft. deep. The shaft, sunk by the company, is designed to serve the adjoining No. 18 mine when operations are resumed, and also will be used as a manway. Consequently, it is equipped with an easy-walking stairway fabricated by the company and equipped with non-slip treads made of an interlocking grating.

When operating at high speed, the new No. 19 fan will deliver 135,000 cu.ft. of air per minute with a 2-in. water gage. At present, serving No. 19 alone, and operating at low speed, the volume is 83,000 c.f.m. Fan characteristics are such that nearly maximum efficiency is obtained at either speed. An Allis-Chalmers linestart motor with a floating motor drive, or pivoted motor mounting, supplies power. Motor and controls are located in a separate building closed off from the fan housing. A separate set of contactors is provided for high-speed (900 r.p.m.) and low speed (600 r.p.m.). Motor output is 100 hp. at high speed and 45 hp. at low speed. Protection is afforded by series inverse-time-limit overload relays, and short-circuit and line disconnectors.

The fan is started and stopped from the No. 19 drift mouth, approximately one mile away, through a selective master control equipped with indicating pilot lights to determine motor speed and also to indicate whether or not the fan starts on that speed. A five-conductor control cable with a triple weatherproof cover connects the motor and the master control. This cable is carried on a 3/16-in. steel messenger cable and is

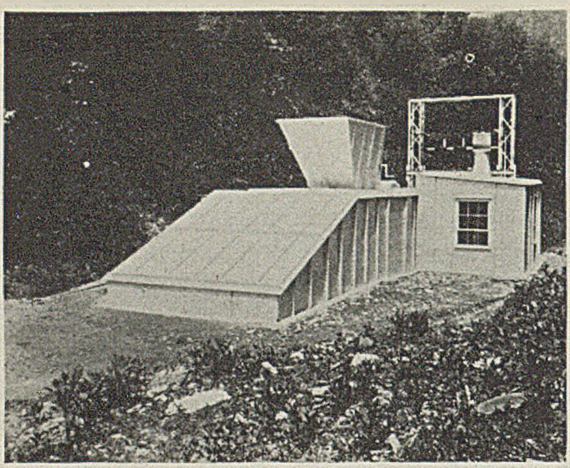


Fig. 6—Two-Speed Fan Over New Airshaft at No. 19 Mine

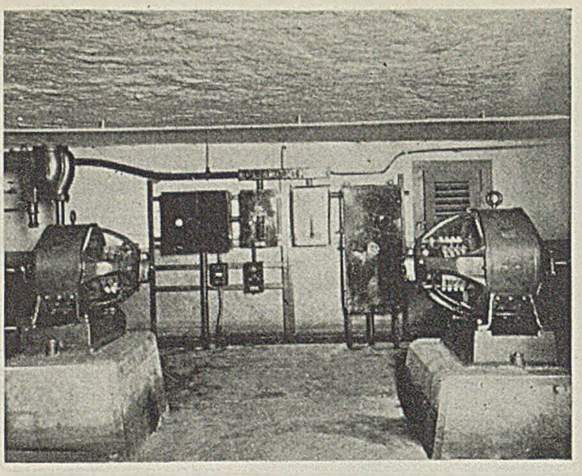


Fig. 7—Underground Pumping Station, Rossmore Mine

rubber-insulated to withstand 550 volts. Transformers are located at the fan and are tapped through an auto-transformer for lights.

Activities underground centered on the cleaning up of airways to reduce resistance and on the improvement of temporary and permanent stoppings, doors, overcasts and other control equipment to cut down air losses. Every effort is made to insure that even temporary air-control equipment is airtight, and this policy has been extended to the use of concrete blocks in building stoppings with a life of only a few months. Permanent doors are hung between walls made of concrete blocks, as described on p. 342 of this issue, and are arranged so that they close automatically. A definite system of installing temporary and permanent ventilation controls in driving entries (Fig. 12) also has been adopted. To supply the concrete blocks required for ventilation construction and for other purposes around the mines and surface plants, the company has installed its own block factory at No. 5 mine. The No. 5 plant has a capacity of 200 blocks per day and employs 2 men. Large overcasts are built of pressed-steel arch plates set on concrete block walls. The ends of the overcasts are filled in with cinder blocks plastered to stop leakage. Small overcasts are built entirely of concrete.

Somewhat unusual drainage conditions in the Rossmore mine were responsible for the installation of a 1,500-g.p.m. underground pumping station. The Rossmore coal area lies at the bottom of a syncline, with abandoned operations of other companies on either slope. Consequently, Rossmore is forced to handle the drainage not only from its own workings but also from the neighboring mines. This condition dictated the construction of the underground station, together with the accompanying sump and drainage ditches.

Pumping equipment consists of one 1,000-g.p.m. and one 500-g.p.m. Barrett-Haentjens centrifugal pump, with a priming pump and automatic control for starting and stopping. The priming pump serves both the main pumps, each of which is driven by a Westinghouse Type SK, d.c. motor, taking power from the trolley system. Suction head for both pumps varies from 6 to 10 ft., depending upon the quantity of water in the sump, while the discharge head is 150 ft. The pumps start and stop automatically, depending upon the operation of float switches in the sump. Discharge from both pumps is taken to the surface through a 10-in. Wyckoff wood line. Under ordinary conditions, the pumps are expected to operate intermittently, but heavy rainfalls during the past month have made pumping continuous.

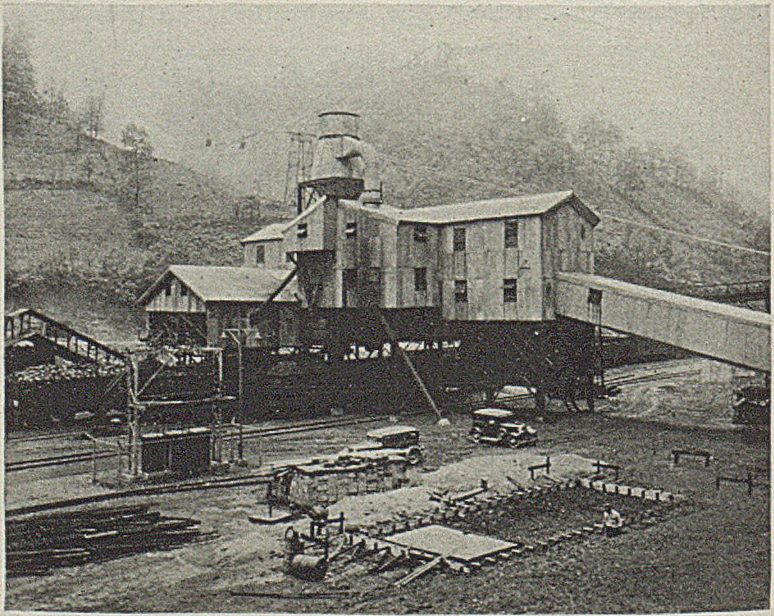
A second underground pumping station has been built at No. 5 mine. Equipment consists of two 300-g.p.m. Barrett-Haentjens centrifugal pumps discharging through boreholes.

Installation of an air-cleaning plant at No. 5 and a new tipple at Micco were the major items in the preparation program. Market considerations dictated the purchase of the No. 5 plant to clean 1½-in. slack. The average ash content of 1½-in. slack shipments formerly ran 8½ per cent, or 1 per cent more than the allowable average required by the market. Consequently, one American pneumatic separator with cyclone dust collector was installed to bring the ash down to the allowable average and thus make possible an increased realization per ton without too great an expenditure for cleaning.

A conveyor system and surge bins have been installed to permit mixing of the table feed to iron out variations in ash and moisture content. Use of this equipment has reduced materially variations in the ash content of the loaded railroad cars.

Installation of the air table at No. 5 enables the company to ship a domestic stoker size from this operation. Spec-

Fig. 8—No. 5 Tipple and Air Cleaner. Aerial Tramway Appears in the Background



ifications for this size require that it shall be a slack with the very fine dust removed. By diverting the dust aspirated from the tables, it easily is possible to load this type of coal.

Refuse from both the No. 5 preparation plant and mine is disposed of by a B. & B. aerial tram; capacity, 50 tons per hour. At the present time the tramway actually handles 30 tons per hour, the major part of which is mine refuse resulting from clean-up activities underground. A second aerial tramway (Interstate), with a capacity of 10 tons per hour, was installed at the Rossmore mine. The distance from the loading point to the dump is 2,500 ft. at No. 5 and 1,500 ft. at Rossmore. One man is employed in disposal at each mine, superseding forces of ten each with the old systems.

Before installation of the tramway at No. 5, refuse was dumped from mine cars on such land as could be reached near the surface plant, usually within 3,000 ft. While this proved more or less satisfactory during the old days, available dumping space grew less as time wore on and the clean-up program and construction work at No. 5 made a change necessary. The tramway was the answer, and resulted in a handsome reduction in cost. Present outlay for disposal at No. 5 is 20c. per ton of refuse, or 1.4c. per ton of coal. With the old system, cost per ton of refuse was 60c., or 4c. per ton of coal.

Earling mine also offered a major clean-up problem, which led the company to install a Kanawha hillside dump on the opposite side of the mountain from the tipple. Installation cost was $4,000, and the equipment handles, on the average, 50 cars of refuse, or 125 tons per day, at a cost of 17c. per car. With the methods previously in use, the cost of disposal at Earling was 30c. per car.

Equipment maintenance at the Logan division mines is based on periodic inspection and overhauling. Every six months, locomotives, cutting machines and other mining equipment is brought out for overhauling and, if necessary, rebuilding. In addition, mine locomotives must be inspected at the end of each shift by the locomotive runner, who also is charged with the duty of cleaning off all dust and dirt with compressed air. Each mine is equipped with a portable air compressor and the necessary air hose for this purpose. Through daily inspections, periodic overhauling and constant attention to smooth operation, armature failures at Logan division mines have been reduced 75 per cent in late months.

In line with maintenance improvements, a new repair shop was built at No. 5 for car, locomotive and machinery reconditioning. One end of the 36x80-ft. steel-frame metal-sheathed building is equipped for car repairing, with the necessary machinery, including wood saws, lathe, forge, drill press and grinder. The other end of the shop contains the locomotive and machinery repair end, including the motor pit and an Ingersoll-Rand portable air compressor. Here each locomotive is inspected and cleaned off at the end of the shift, and here also the routine overhauling and reconditioning of all the mining machinery is done. Spare parts most commonly needed are kept in cabinets along one side of the locomotive and machine repair end of the shop. Two 5-ton Wright cranes are provided for the necessary lifting and removal of heavy parts.

Systematization of operating methods and the adoption of operating standards has accompanied the modernization of

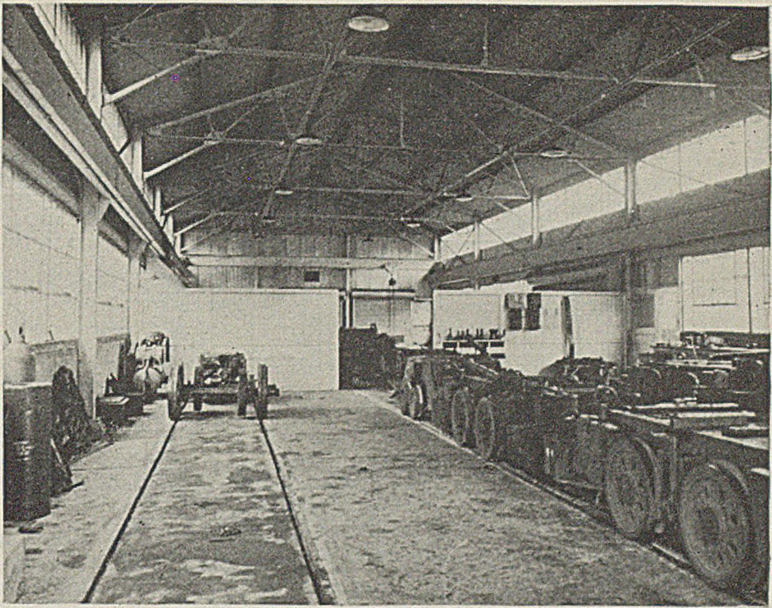


Fig. 10—Interior of No. 5 Repair Shop

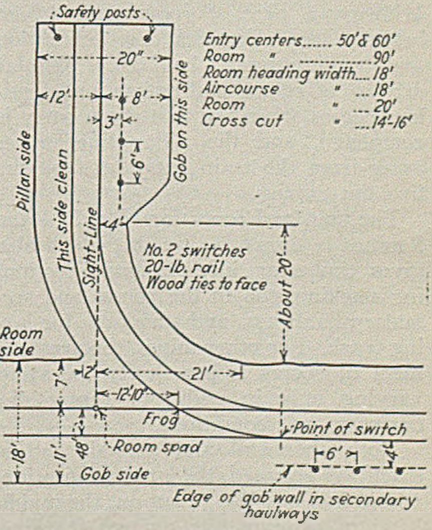
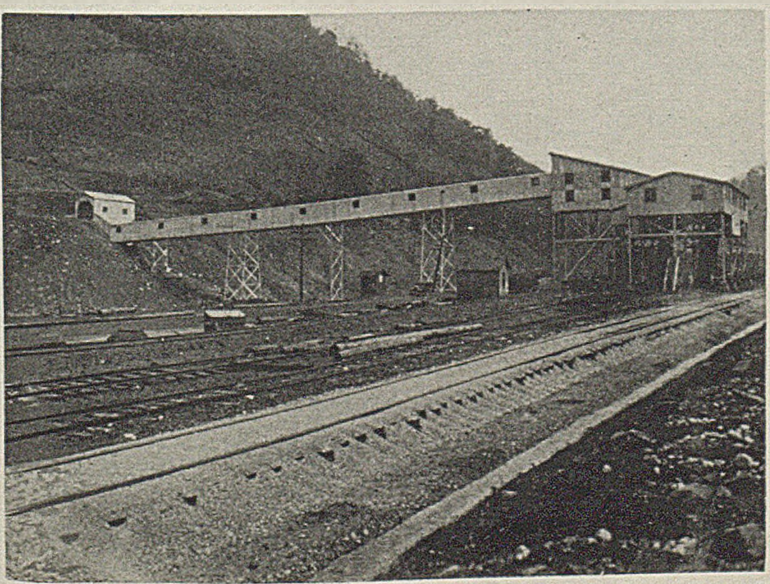


Fig. 11—Standard Room and Entry, Mines 3, 4 and 5

Fig. 9—New Micco Tipple



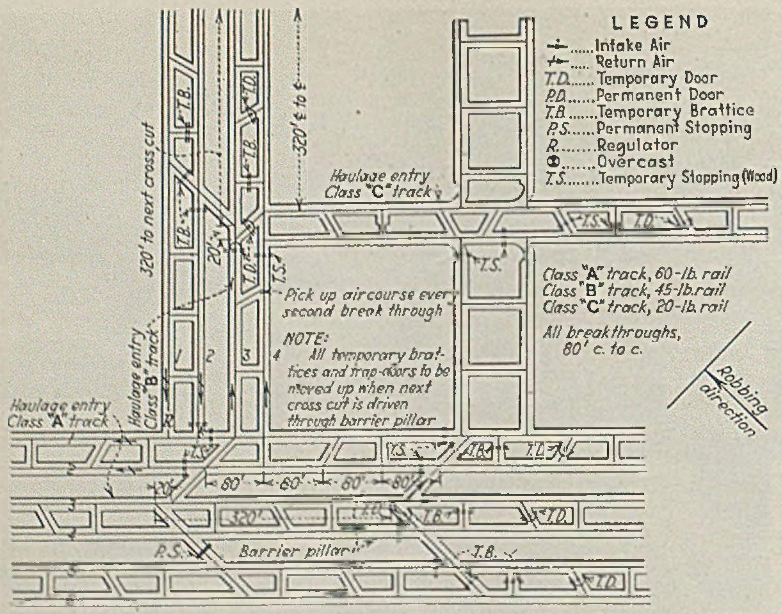


Fig. 12—Standard Entry-Driving and Temporary Ventilation Plan

equipment at West Virginia Coal & Coke properties. The mining standards cover the driving of entries and rooms, timbering, track, ventilation and other activities subject to standardization. In general, extraction is based upon the panel system. The area to be mined is divided into blocks by main and flat entries at right angles. Room entries, paralleling the main entries, are turned off the flat entries (Fig. 12) and are driven through to the parallel flats. Midway, a pair of rooms are driven between room entries for ventilation and, if necessary, haulage. Regular driving of rooms and extraction of pillars begins when the first room entry is completed, and the pillar line moves away from the main entry between the two flat entries.

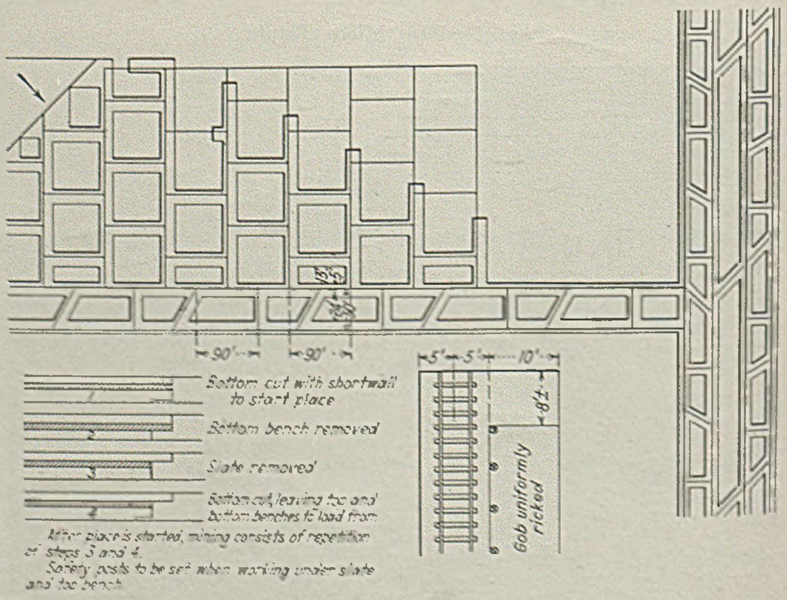
The standard room for Nos. 3, 4 and 5 mines is shown in Fig. 11, which also gives timbering information, directions for stacking gob in the rooms and secondary haulways, and standards for laying track. For other mines, the arrangement of rooms is practically the same, varying only in width or center distances to suit conditions.

Both shortwall and arcwall cutting machines are used, the latter in locations where it is possible to cut out the middle band of slate in one or two traverses across the face. If these cuttings contain much slate, they are gobbed at one side of the room in accordance with the plan in Fig. 11. In certain mines, however, the middle band thickens materially, and in this case the coal is mined in two benches, as shown in Fig. 13. Where this system is in force, company men on the night shift shoot the rock and pile it in the gob space (15 ft.) back of the cut. A "Brownie" pit-car loader is used in stacking the rock. Cutting is done by shortwall machines. If pillars are drawn in sections where the slate is thick, room centers are 90 ft. and the rooms are driven 20 ft. wide. In the heavy-slate sections where pillars are not removed, room centers are reduced to 35 ft., while the room width remains at 20 ft.

Improved supervision and some degree of standardization of tasks has accompanied the systematization of mining methods. Standardization of tasks, however, does not contemplate the setting up of definite performance quotas for each man. With the knowledge that the supervisory force has of the capabilities of the working force on different tasks, it has been a comparatively simple matter for the mine officials to arrange conditions so that each worker performs a full day's work. On some tasks, the setting of even an informal day's work is hardly possible, and, in addition, no attempt is made to set up tasks for the loaders, the company relying more on supplying a man with all the cars he desires, and leaving the rest to his judgment and inclinations. While, as set forth above, no hard and fast rules are followed, tighter supervision is given credit for the greatly increased efficiency of the day force at the different mines, which accounts in turn for the major part of the net reduction of 11.6c. in mining cost in 1931.

Supplies also have received their fair share of attention in late months, with the result that inspection before delivery has been tightened up to prevent the inclusion of substandard material, such as cull ties and posts, etc. The delivery system also has been revised to insure delivery at the exact spot to cut down handling labor and increase the actual time spent by day men in productive work. As a supplement to inspection and delivery activities, a rigid reclamation system has been adopted. Every six months, surveys are made by the engineering force to discover unused supplies. A list, giving quantity and exact location, is furnished the mine superintendent, and he is expected to recover the material and check it off his list as he uses it.

Fig. 13—Method of Mining in Two Benches in Heavy-Slate Areas Where Pillars Are Drawn



DUAL SYSTEMS

+ Electrical and Mechanical

Protect Barnum Pump Station

By W. KEISER

Superintendent, Electrical and Mechanical Department
The Pittston Co.
Scranton, Pa.

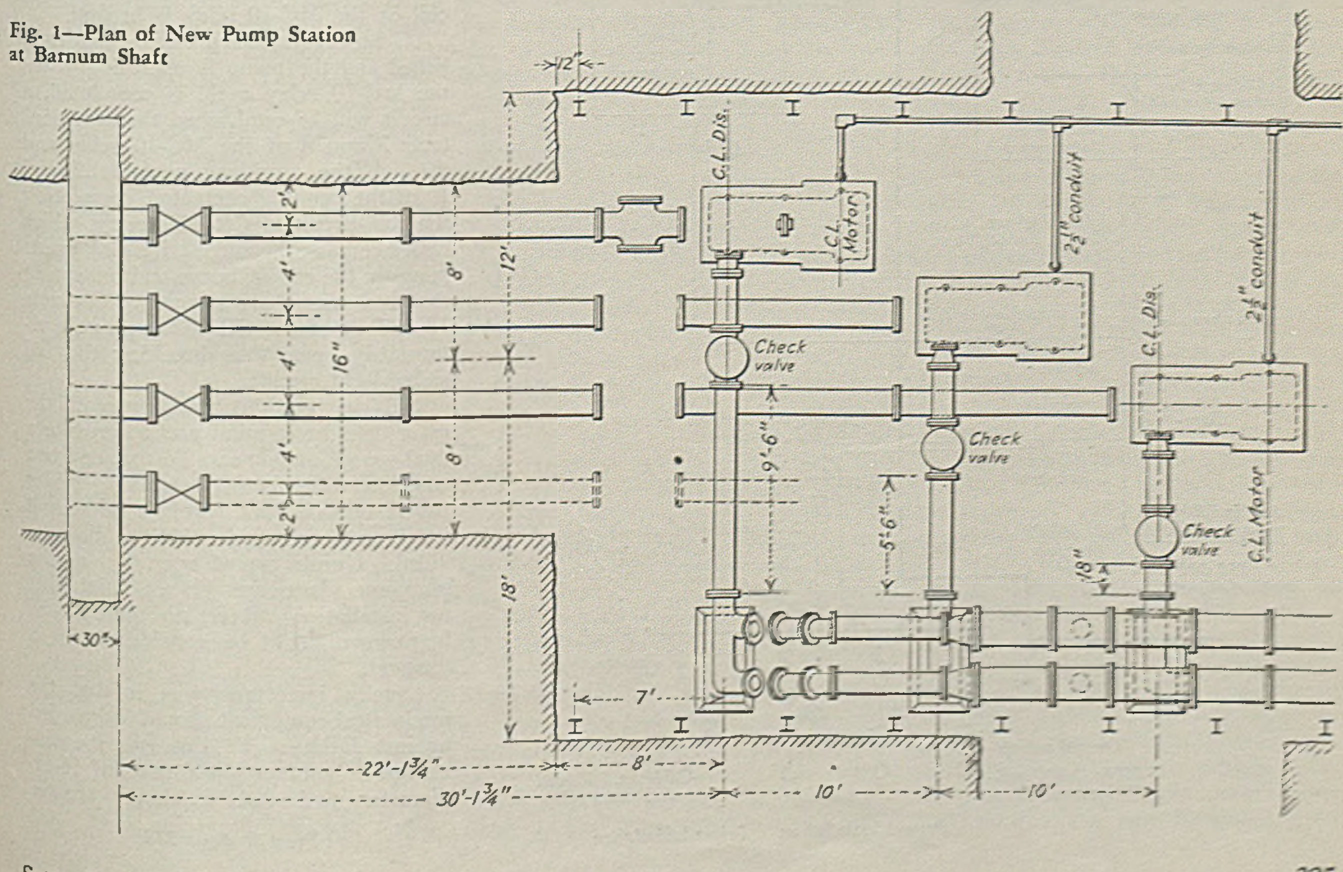
BECAUSE of the closing down of a neighboring colliery which delivered 7,000 gal. of water per minute to the surface, the Pittston Co. has installed a new pumproom in the Clark bed at Barnum Shaft, No. 9 colliery, in Duryea, Pa., with a present capacity of 7,500 g.p.m. and with provision for an ultimate capacity of 10,000 gal. In this pumproom are three 300-hp. pumps, each capable of lifting 2,500 g.p.m. to a height of 375 ft.

This station has been so located that the pumps, to avoid the suction of air, receive their water at a head of 2½ ft. above the top of the pump mains, but provision is made to keep the water out of the pumproom should it rise to a level 18 ft. higher. By this means provision is made for a storage of approximately 400,000,000 gal. of water adjacent to the station. A 1,500-kva. transformer station had already been installed at the surface, providing for the driving of the pumps necessary to the operation of No. 9 colliery—prior to the greater influx of water from outside—and for the operation of other equipment. This transformer station equipment has been supplemented by another 1,500-kva. installation, the sole duty of which is to drive the new pumping equipment. The secondary of the old station is now controlled by the new substation, which will itself be controlled through automatic secondary switches.

Power is received at 23,000 volts and stepped down 4,160 volts. Between the transformer stations and the borehole leading from the surface down to the Clark bed, in which is the new pump station, and on to the Red Ash bed, in which is the old pump station, dual lines are provided, so that in case one line fails the other line can be switched on. Down the borehole, two sets of cables are installed, and these can be switched to either station.

At the connection of the borehole with the Clark bed, two three-conductor armored cables pass, either one of which is capable of carrying the entire load. Through a system of disconnecting switches, these cables can be oper-

Fig. 1—Plan of New Pump Station at Barnum Shaft



ated either in parallel or singly. In the pumping plant, dual buses are provided, and they in turn, through disconnecting switches, can be operated singly or in parallel. Three tap pipes of 12-in. diameter made of bronze metal 2 in. thick pass through the dams, one for each pump.

The station is designed for full-automatic operation, with the electrical equipment for the starting of the pumps so arranged that any unit can be selected as the one that will start at any predetermined water level. Particularly valuable is this provision, because any one of the three pumps can then be chosen temporarily as the one to start automatically when the water reaches the lower level. By reason of this power of selection, which enables the units to be used in rotation for the more continuous service, operation and wear can be divided more equally among the several units. The control of the units also is interlocked so as to prevent all the pumps starting together when, after voltage failure during operation, the power once again returns to the feed lines.

Pumps and motors are protected against excessive bearing temperature, broken discharge columns, broken or blocked suction lines, low water in dam and overcurrent in motor. Further, the automatic devices give the engineer in the shaft hoist house a signal if any of them fail to function.

The starting cycle of the pumps is as follows: When the water rises above the dam to the level for which the dam-pressure switch has been set, that switch closes, thereby energizing the MC-10 relay shown in the center of Fig. 3 and completing a circuit through contacts 5 and 6 of that relay. This also, by a circuit passing through the MC-10 relay, energizes contacts 1 and 2 of the discharge-pressure switch, which are normally closed, also the suction-line vacuum switch, the bearing temperature relays and the interlock on the controller or short-circuiting switch of the particular pump which is about to be started, all their contacts being closed under normal conditions. It also energizes the control coil on the motor starter through the overload relay.

If the contacts on all the devices are normal and closed, the motor will start and come up to speed and the flow switch will close its contacts. When the discharge line of the pump is full, the pressure switch contacts 3 and 4 will close, thus shorting out contacts 1 and 2 of that switch, thereby cutting off the current to contacts 5 and 6 of the MC-10 relay.

MC-10 relay continues with its contacts 5 and 6 still closed until the time elapses for which it is set, at which time these contacts open. If the pressure on the pump discharge has been established before that time so as to open contacts 1 and 2, there can be no closed circuit, through the motor of the MC-10 relay, even after the completion of the time interval.

If pressure is not established on the discharge column before the MC-10 relay completes its time cycle, contacts 5 and 6 open, thus opening the control coil circuit on the motor starter and shutting down the pump. The same action of the MC-10 relay closes contacts 7 and 8, completing a circuit through a red signal light placed in the hoist house on the surface. The red signal light indicates that the unit has made an attempt to run but was locked out because of the functioning of one of the protective devices, and the pump will not attempt to start again unless the voltage circuit of the holding coil on the MC-10 relay is broken.

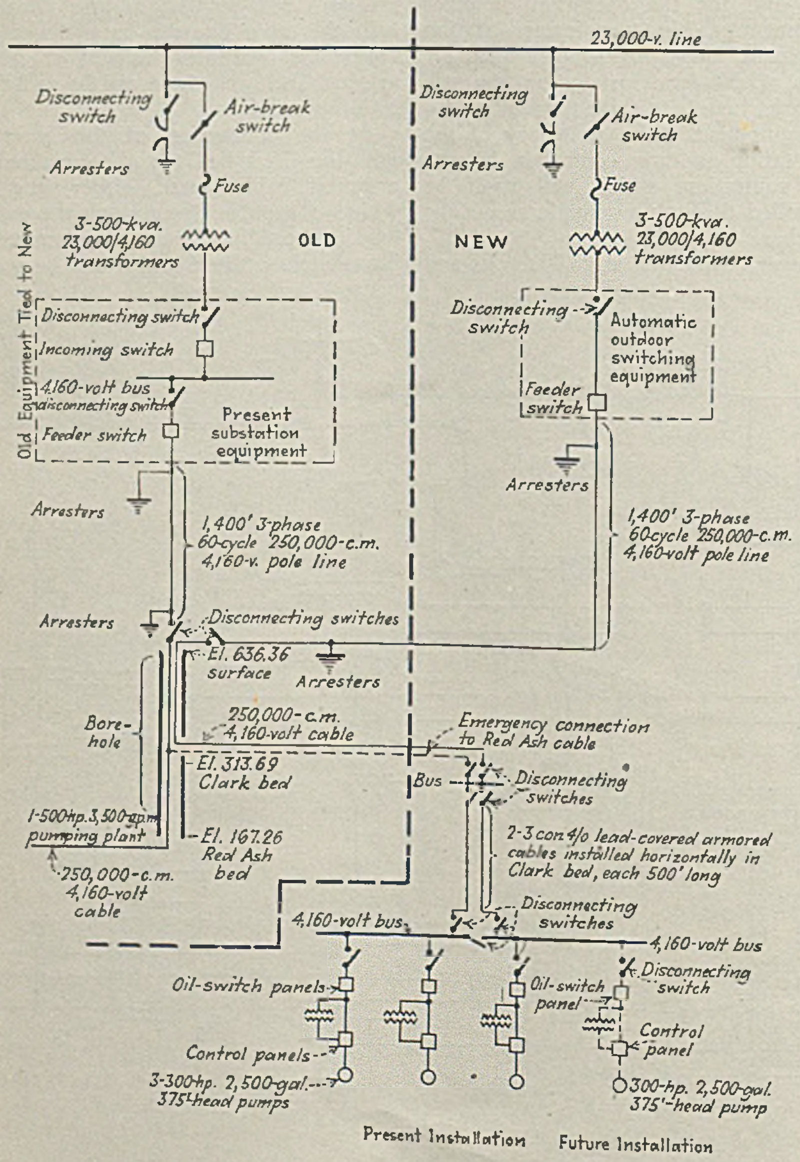
If, however, the pressure is established and the pump is operating when the MC-10 relay cycle is completed, a circuit will be established through contacts 7 and 8 of the MC-10 relay and through the auxiliary contacts 9 and 10 of the running contactor, completing the coil circuit of CR-2820 relay, which closes contacts 11 and 12, lighting green lamps in the engine house and indicating that the pumps are running. Contacts 13 and 14 of the CR-2820 relay simultaneously open, thus breaking the red signal-light circuit.

In laying out this pumping plant the main thought in mind was to provide a dual source of power. To that end two complete transformer stations, feeder panels, outside lines, borehole cables and inside armored cables had to be provided. Uninterrupted operation of the pumping plant was so essential that no installation subject to the risk of breakdown could be considered for a moment.

Equally important was it that the mechanical equipment should be guarded against failure. To this end the discharge or column pipes, each of 16-in. diameter and 800 ft. long, are in

(Turn to page 333)

Fig. 2—Because Lightning on the Hills Causes Frequent Outages, All Electrical Equipment Is in Duplicate

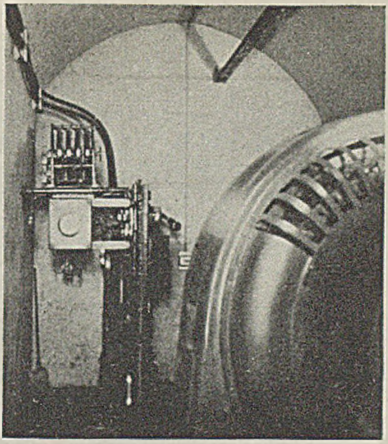


[THE SECOND OF TWO ARTICLES ON ELECTRIFICATION AT VALIER]

ELECTRIFICATION

+ Plays Major Role

In Transportation and Hoisting



The 500-kw. Motor-Generator With Full-Automatic Control Is Contained in a 11x22-Ft. Underground Room

AFTER four years' experience with combination battery locomotives, the mine officials of the Valier Coal Co., in southern Illinois, are satisfied that this type is well suited to the duty of car changing and switching cars in and out of rooms in loading-machine territory. The battery charging is automatic and takes place at the times that the locomotives are operated from the trolley. No charging stalls or panels are required. It is not necessary to take time out for charging; therefore, the locomotives can be used for delivering material at night.

In Valier mine these locomotives haul an average of but 300 ft. Relay locomotives work between them and the main haulage units. The thirteen combination locomotives rated as 7-ton units were made from General Electric cable-reel locomotives. All are equipped with 56-cell lead batteries. The relay equipment previously mentioned consists of five Jeffrey 9-ton and two Westinghouse 10-ton trolley locomotives. Their haul averages 2,000 ft.

There are still twelve cable-reel locomotives working in the mine. They are confined to pit-car-loader gathering and severe gathering service where the hauls are extra long or traverse unfavorable local grades. The hauls average 1,200 to 1,500 ft. This cable-reel equipment consists of seven Jeffrey 8-ton, two Goodman 8-ton and three General Electric 8-ton locomotives.

Four locomotives working on the main hauls handle 1,600 cars, or 6,400 tons, per day. Two are super-motored 20-ton units each containing three 120-hp. motors, and another is a 15-ton, also super-motored, with two 120-hp. motors. All three were made by Goodman and have plain journal bearings and contactor control. The fourth is a General Electric 15-ton with two 90-hp. motors; this locomotive has been changed to contactor control and blower cooling.

By reason of a complete equipment of track signals and electric switch throwers, no tripriders are employed on main haulage locomotives. All cross entries on the main haulage are protected by signal boxes, the red lights of which are turned on and off by the motormen jerking the ropes of overhead pull switches, which is done without stopping.

Track switches on the main haulways at all cross entries are equipped with "Electric Switchman" electro-magnetic throwers which include green and yellow lights to indicate switch position. Without stopping, the motorman throws the switch to either position by pushing the trolley pole slightly to one side or the other to make the pole head contact with one of two metal slides mounted on either side of the wire. All of the switch-thrower and signal equipment was furnished by the Mines Equipment Co., of St. Louis, Mo. Main haulage locomotives are equipped with a pull-chain mechanism by which the motorman can pull the coupling pin at the opposite end without stopping the locomotive or leaving his cab.

Direct current is supplied for haulage by five 250-volt motor-generator substations, one of which is a 100-kw. full-automatic portable unit now operating at a point 6,800 ft. from the shaft. There are three 300-kw. units, one with manual control near the shaft bottom, one with full-automatic control 2,000 ft. away, and the third with manual control 7,200 ft. away. At a point 3,600 ft. from the shaft there is a 500-kw. full-automatic unit installed in a room which has but 11x22 ft. inside dimensions. This substation and the 300-kw. one, which has automatic control, are started and stopped by time clocks. All substations operate in parallel and the series field shunts of each are adjusted to suit the respective locations.

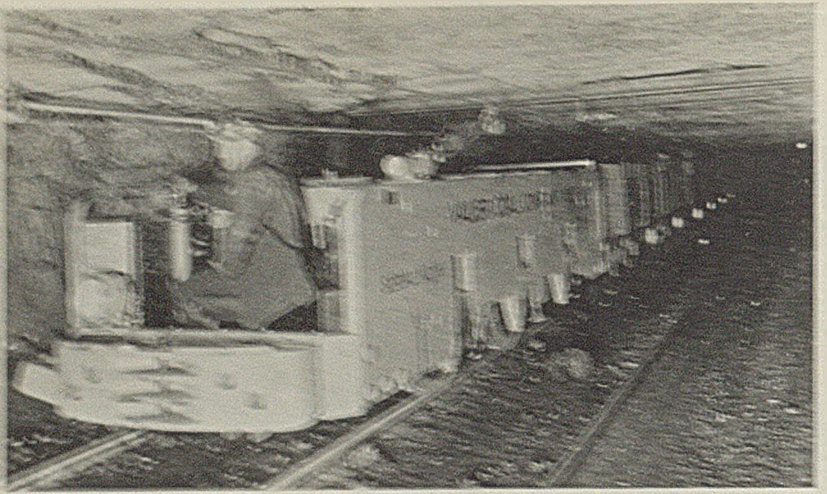
Feeders of 1,000,000-circ.mil section parallel all 4/0 trolley wire on the main haulageways but are not extended beyond the main partings. At every branch taken from the main d.c. feeder system a Columbus automatic reclosing circuit breaker is installed. These are of two sizes, the 1,000-amp. normal 2,000-amp. maximum and the 600-amp. normal 1,200 amp. maximum. Approximately 25 automatic reclosing breakers are in use in the mine.

Changes made in 1929 converted the mine bottom to a one-man equipment over which 250 cars per hour can be handled. The two-car air-operated rotary dump was replaced by a single-car electric; a new car feeder and automatic caging horns were installed; and the original skip-loading gates replaced with new equipment furnished by Roberts & Schaefer Co.

In comparison to the 60-hp. motor which was required to compress air for operating the old dump, a 10-hp. motor drives the new dump. This is a 220/440-volt two-speed motor equipped with solenoid brake and magnetic control. Dump rotation is started by push-button, but at the end of the revolution the dump is automatically slowed and stopped at the correct point by the motor being connected for low speed operation and finally the shutting off of power and setting of the solenoid brake.

The new dump, being but half the length of the old and of sturdy construction, is much stiffer and consequently will have a lower maintenance cost. The old dump turned only 130 deg. and then back; therefore the mine cars were not equipped with swivel couplings. Equipping with the swivels has been completed, eliminating two additional men formerly needed at the dump to uncouple and couple.

Three cars, approximately 12 tons, are hoisted per skip. Measuring pockets are not used; therefore the loading equipment includes but one gate per skip. As a car is dumped the coal divides and flows into two storage pockets. Starting the shift with empty pockets, the first skip is loaded after



Main Haulage Locomotives Are Operated Without Trailers

three cars are dumped; therefore this first skip carries but 1½ cars. After 3 more cars are dumped and one skip pocket contains 3 cars and the other 1½ cars, the second skip is loaded from the pocket containing 3 cars, and from then on a skip is "belled" each time after 3 cars are dumped. The gates are mechanically operated by direct contact of a lever with the descending and ascending skip.

The dump operative pushes a button to start the one-car-length automatic trip feeder, takes a paper ticket from the car and places it in the slot of a Streeter-Amet weight recording scale attachment, pushes a button to start the dump and, after the dumping of three cars, bells the engineer to hoist. The scale attachment stamps the car weight on the ticket and pushes the ticket out into a box.

On the loaded side of the dump there is a star wheel spragger the brake of which is normally kept set by a weight. A steel cable extending from this brake to the caging horns holds the brake off while the horns are open.

One man on the empty side using an 8-ton locomotive handles the 1,600 or more empties in 8 hours. Tracks over which he runs are equipped with electric switch throwers operated from the locomotive controller handle. Contact strips on two section insulators in the trolley line provide the means of selecting the switch position. Passing the trolley wheel over a section insulator with the controller on an operating point causes the switch to throw in a fixed direction.

Another man operating a 10-ton locomotive pushes the loaded trips to the car feeder. Upon reaching the bottom, the main haulage locomotives drop their loads by a flying switch which is automatic except that the motorman puts tension on a spring in a chain which pulls the coupling pin. The track switch is thrown automatically when the trolley wheel or harp contacts with a steel wire brush mounted beside the trolley wire.

A dispatcher located in an office a few hundred feet from the dump regulates all main haulage trips. An installation of electric communicating signals between operating points on the bottom has the effect of bringing all points within observation of each other. For instance, on the empty side of the dump

Average Performance of Main Haulage Equipment

Individual Locomotives	Length of Haul, Feet	Cars Handled Per Day
20-ton	7,200	250
20-ton	7,200	180
15-ton	5,300	250
15-ton	6,400	250

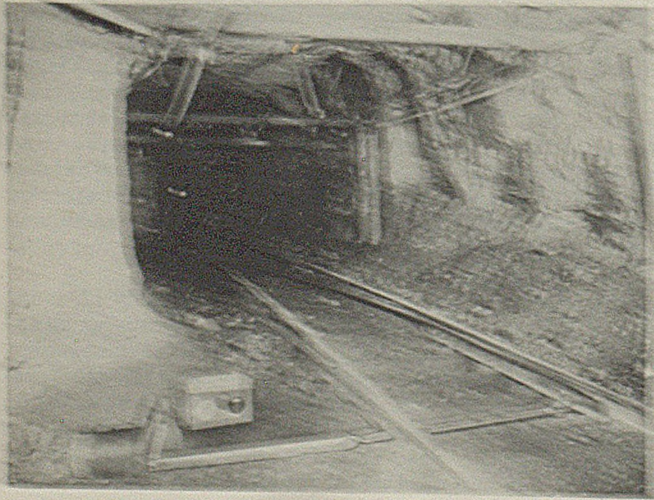
there is a signal box in which any combination of numerals can be lighted by the dispatcher to indicate to the coupler the number of cars to assemble into a trip for the next haulage locomotive. When the trip is assembled the coupler switches the lights out, which action also signals the dispatcher, and he in turn signals the locomotive to proceed.

Electricity is used to the utmost at Valier. Even the handling and lifting of all materials on the top is done entirely by machinery (*Coal Age*, Vol. 35, p. 469). Because of this complete modernization inside and out and the fact that alternating current is used for face equipment and combination locomotives are employed for loading machine gathering, the power equipment per ton of coal produced is significant.

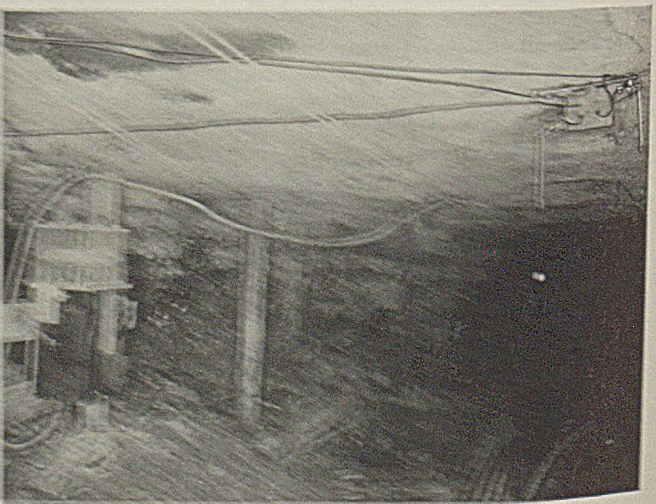
For a month of practically full-time operation the data are as follows: Purchased, 610,000 kw.-hr.; net bill, $10,168; tons produced, 122,801; kilowatt-hours per ton, 4.96; power cost per ton, 8.3c.; cost per kilowatt-hour, 1.67c.

Because the mining plant includes no dwellings or town buildings, comparatively little of the power listed above is used for lighting. Mine drainage consumes but an insignificant quantity of power and there is no mechanical coal-cleaning equipment to drive. The mine fan consumes about 105,000 kw.-hr. per month, or approximately 17 per cent of the energy requirements, during months of full-time operation.

The skip hoist is driven by a d.c. motor powered through a flywheel motor-generator set, and the total lift is 700 ft. For February, 1931, when the mine operated but 12 days, the coal hoist consumed 0.88 kw.-hr. per ton.



Electric Switch Thrower With Position-Indicating Lights Mounted Directly On It

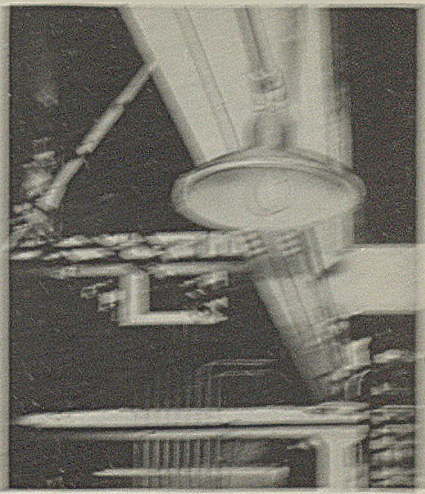


Track Signal Rope-Pull Switch at Upper Right and Reclosing Circuit Breaker at the Left

THE SECOND OF TWO ARTICLES ON PREPARATION PLANT LIGHTING

CLEANING PLANTS

+ Present Special Lighting Problems



Dustproof Reflector Installation

By J. H. EDWARDS

Consulting Editor, Coal Age

NEXT in importance to intensity or quantity of light per square foot in preparation plants is the avoidance of glare. This can be accomplished reasonably well by mounting the lamps quite high. Avoiding glare by this method, however, has the objection that it requires a much higher total wattage in order to obtain the desired intensity on the picking table, which may outweigh the advantage of the tendency of lights so placed to eliminate shadows.

Another method, commonly considered preferable and one which is less wasteful of power, is the mounting of reflecting units so the bottom line is an inch or so below eye level, or approximately 2 ft. above the table. With this arrangement the units must be closer together—that is, not over 5 ft.—and must be of the wide distributing type. Lamps for this installation should be 200-watt size or larger.

Glare from glossy coal sometimes is wrongly diagnosed as "too much light." The real difficulty is that the source has an intrinsic brilliancy greater than is practical. The lamp filament or other exceedingly bright part of the lighting unit is mirrored on the shiny surface of the coal. Use of a diffusing glass on the bottom of the unit is the answer.

At times, daylight illumination through skylights is ideal for picking, but there are many difficulties. In a dusty plant the glass may soon become so dirty as to reduce the light below the desired amount on a medium to dark day. Bright sun shining through skylights onto a picking table may cause discomfort in the summer. Quick and wide variations in light intensity caused by heavy clouds suddenly obscuring the sun distract the attention of the men, thus affecting uniformity of product.

For these reasons it might be preferable in many cases to omit skylights near the tables and depend entirely on the unvarying illumination of electric lamps. A small additional cost of plant power and lamp renewals is the only disadvantage. An example of preference for artificial light—but in another industry—is the windowless factory of the Simonds Saw & Steel Co. at Fitchburg, Mass. The illumination is supplied by reflector units each containing a U-shaped mercury tube and 750-watt Mazda lamps.

Because of the common use of shaking screens, vibrating screens and agitating table decks, structural vibration is common in preparation plants. As a rule, it is best to equip lighting units of the picking table with shockproof sockets. The same holds true for practically all other lighting fixtures in the plant. Thirty-five per cent of the new plants included in the *Coal Age* survey of preparation-plant illumination reported using shockproof sockets.

If it is suspected that lamps are giving short life, it is a good plan to keep a record of the dates lamps are put in and taken out, especially if someone in the plant has enough spare time to do it and therefore not increase cost. A convenient method of dating is by scratching the figures on the brass base of the lamp by using a small three-cornered file ground to a sharp point. If the burning life of lamps does not average around 1,000 hours, conditions of voltage and vibration should be carefully investigated. Continual operation on overvoltage materially reduces life of lamps. Damage from a condition of overvoltage or of vibration is in either case accentuated by presence of the other. Undervoltage burning increases lamp life but reduces the light given off to such an extent that the unit over-all cost of illumination at a given intensity is materially increased.

Effect of vibration is noticeable upon close examination of the shape of the filament. Stretched sections in the filament coil with attendant sag, or sharp bends, are visible effects of vibration or shock suffered by the lamp while burning.

In designing the general lighting for a preparation plant, the first consideration is safety. Machinery, stairways, railings, passageways, changes in floor level, equipment or structural members limiting overhead clearance, and all other points of danger should be illuminated to an intensity of 3 to 5 foot-candles, and in the case of overhead obstructions particular attention should

Preparation Fundamentals

This article is the tenth in a series on the fundamentals of modern coal preparation. Preceding articles in this series were:

I. Shifting the Plant to the Preparation Job, by J. B. Morrow, February, 1931 (Vol. 36, p. 57).

II. Structural and Construction Problems, by Andrews Allen, March, 1931 (Vol. 36, p. 125).

III. Electrification Problems in Dry Plants, by W. D. Turnbull, May, 1931 (Vol. 36, p. 247).

IV. Electrification Problems in Wet Plants—I, by E. J. Gealy, July, 1931 (Vol. 36, p. 369).

V. Electrification Problems in Wet Plants—II, by E. J. Gealy, September, 1931 (Vol. 36, p. 477).

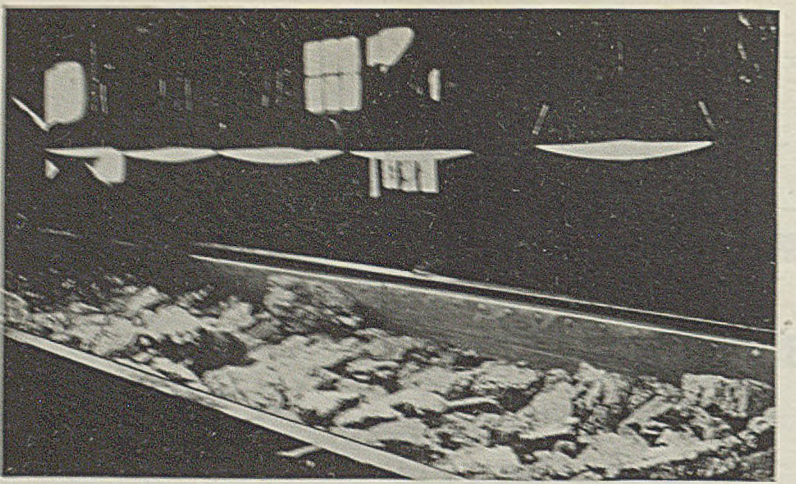
VI. Refuse Disposal at Cleaning Plants, December, 1931 (Vol. 36, p. 609).

VII. Re-treatment of Coal Middlings, by H. F. Yancey, January, 1932 (Vol. 37, p. 11).

VIII. Power Transmission in Coal Preparation Plants, July, 1932 (Vol. 37, p. 273).

IX. Illumination an Essential Requirement, by J. H. Edwards, August, 1932 (Vol. 37, p. 303).

Subsequent articles in this series will appear in later issues.



Electrical Daylight Facilitates Picking Where Dust-Tight Cover Glasses Are Easily Accessible for Cleaning

be given to shielding the light so that glare or blinding effect does not offset to a large extent the intended benefit of the illumination. In addition, it is well to mount a small red light on the obstruction itself.

In many plants sufficient general illumination for ordinary operation would be provided by units located only with respect to passageways and danger points. All of these lights should be on one or several circuits separate from other lighting. On other circuits should be fixtures located above open floor spaces which when turned on would raise the general illumination to 10 foot-candles when repair jobs, special tests or the like are to be carried on.

Plug receptacles should be arranged so that any point in the plant can be reached with a portable extension 40 ft. long. Automatic extension reels are a great convenience in locations where extensions are used frequently.

Special lighting will be required at points of routine inspection such as on certain types of pneumatic separators where adjustment of fingers may be necessary to maintain the proper cut between clean coal, middlings and refuse. Where these lighting units are inside of the hood and subjected to coal dust, the wiring should be in conduit and the lamps housed in vaporproof fixtures. Since the enclosing globes should frequently be wiped free of dust, wire guards over the globes are impractical unless of a quick-detachable type.

At several plants using the large type of pneumatic separator, where men may want to enter the space above the table deck, there has been some concern over obtaining a safe method of illumination in this dust-laden space. One plant, for instance, prefers to have no permanent wiring in the space but instead have the men carry extension cord lights when going in to make inspections or repairs. Another plant prefers to have permanent lighting fixtures of vaporproof type installed above the table deck. In the first instance the argument is that conduit and fixture joints are difficult to make dust-tight, and in the second instance that an extension cord might short-circuit at a point where it lies in coal dust and that the arc might stir and ignite the dust.

It appears that a carefully designed rigid conduit and vaporproof receptacle job properly installed is the safest type in the long run for this lighting above the table.

For general wiring of lighting circuits in preparation plants the BX flexible armored cable is gaining in popularity. Installations of this type total 40 per cent of those covered by the survey. Fifty per cent of the plants use rigid conduit and 10 per cent use combinations of the rigid and BX.

Installation cost is likely to be considerably less with BX cable and the workmen need not have the skill and experience required for a first-class rigid conduit job. With the larger companies rigid conduit still seems to be preferred. Often the BX cable is not properly supported and thus results in a job not pleasing to the eye.

Floodlights equipped with 500 to 1,000-watt lamps are a practical means of illuminating mine tracks and railroad yards adjacent to the plants, but the lights should be mounted quite high to minimize blinding effect. If there is available in the right location a wall space accessible from inside the plant and high enough to be a practical location for a floodlight, a good method is to cut a hole in the wall and mount the floodlight just inside, where it can be maintained with ease and safety.

Recent developments raising the standards of quality and uniformity of prepared coal, demanding a further reduction in accidents and calling for increased efficiency from the labor employed to pick coal and make general repairs to equipment, all point to the necessity of giving the lighting closer attention. The total cost of excellent lighting need be but a small percentage of the plant labor cost.

From the standpoint of safety, lamp voltages higher than 150 should be avoided. The use of key and pull-chain sockets and of metal plate and metal cover switches also should be discouraged. Fortunately, equipment of this type is considered an anachronism in a modern preparation plant. Unprotected gas-filled Mazda lamps should not be used in exposed positions in dusty or gaseous places. Where gas or dust is present, use of the inclosed mercury switch for all current-breaking devices has much to commend it.

Twelfth Annual Model Mining Number

"If you want to see activity," advised a hotel clerk in the anthracite region, "go to Nanticoke and find out what Susquehanna is doing."

And so, for the third time since the Annual Model Mining Number series was instituted, *Coal Age* turns to the hard-coal fields. This time the properties selected for treatment are those of the Susquehanna Collieries Co. and its affiliate, the Lytle Coal Co.

These mines, taken over by the M. A. Hanna interests in 1917, have a history reaching back into the early days of anthracite development. Far more important than their past, however, is their present and future. Sensing the need for revitalization, Susquehanna management several years ago quietly inaugurated a comprehensive program of modernization.

As a result of this foresight and vision, Susquehanna management and properties were prepared in advance to meet the hard conditions facing all industry since 1929. The complete story of this 1932 model of operation will be told in the October issue of *Coal Age*.

HOW TO MAKE

+ Air Survey and Calculate Results

By J. N. WILLIAMSON

Lecturer in Mining Technology
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EFFORTS are being made to locate with some exactitude the sections of mine airways where excessive losses occur. This is done by means of air surveys in which the pressures are determined by accurate aneroids or barometers at various points in the mine or a section of the mine. The instruments used were described in the preceding issue (*Coal Age*, Vol. 37, p. 297). In this second article of the series the character of the survey and the calculations thereto relating are described.

The necessary equipment for the work consists of: (*a*) Two pressure-measuring instruments—one for the traveling observer, and the other as a "control" instrument; (*b*) an anemometer, to determine average air flow; (*c*) a hygrometer, to measure air temperature and humidity; (*d*) a linen tape, to measure cross-sectional areas; (*e*) two watches, one for the traveling observer, and the other for the observer in charge of the "control" instrument; (*f*) a ventilation plan, on which are clearly shown all air splits, stoppings, doors, air crossings, etc.

The particular procedure will depend upon the extent of the ground to be covered by the survey, such as whether the complete mine is to be surveyed point by point, or only one particular air district; or, again, whether the pressure loss between two points only is required. As the general procedure is similar, it is sufficient to deal with a survey of a single ventilating district.

Before commencing the survey, in order to facilitate operations, a definite working scheme should be prepared. First, the ventilation plan should be studied and measuring stations at all critical points provisionally selected. This should be followed by an underground inspection during which the positions of the stations would be finally chosen and numbered, according to some simple scheme, both actually and on the plan.

During this reconnaissance underground, the mine surveyor should accompany the ventilation expert so that he may know where the bench marks at each station are located before setting out to determine their respective levels. The benches should be leveled either shortly before or shortly after the survey, as this measurement must be reasonably accurate. The importance of accuracy in this respect will be realized when it is recalled that 1 ft. of air column at normal temperature and pressure is approximately equivalent to 0.001 in. of mercury. The bench marks should be made at some sheltered spot—as, for example, a refuge hole—near the point chosen for the measurement of air flow.

In order to eliminate the effect of "creep" of the aneroid, due to the sudden change of pressure to which it will be subjected in descending the shaft, it should be taken underground, in a locked box, at least 24 hours before the actual survey begins. It is also advisable to pack this instrument in cotton- or wood-wool, primarily as a precaution against shock, and, secondly, so as to prevent the aneroid from being affected by the heat of the hands.

A base station should be chosen near the beginning of the district to be surveyed. Here is set up, say, a contra-barometer, or an aneroid of a sensitivity and accuracy equal to that to be used in the traversing work. An observer remains at this station during the whole period occupied by the survey, taking readings of the base instrument, say, every five minutes. These observations allow pressure variations to be plotted against time. From the graph are obtained the necessary corrections, if any, which must be made in the readings of the traversing aneroid to compensate for any variation in atmospheric pressure during the course of the survey.

The actual survey begins at the selected base station. Here watches are synchronized and the readings of the pressure-measuring instruments compared and noted. Hygrometric readings and average air-velocity determinations also are made. The traversing observer then proceeds from station to station, according to the prearranged plan, measuring the flow of air, hygrometric conditions and air pressure at each station, and noting the time at which the pressure was observed.

At the end of the survey, the two pressure-measuring instruments are again compared, and if, when due allowance has been made for any initial difference in their respective readings, the indications of the instruments do not agree within 0.005 in. of mercury, the survey must be repeated. A convenient method of tabulating the observations and results of the survey is shown in Table I. If a datum for pressure, temperature and level, respectively, is assumed, the calculations will be facilitated. For the first two of these items the measurements made at the base station are the natural choice for this purpose; and for the level datum, the base station may conveniently be assumed the zero mark.

Where the pressure loss between only two points is desired, the procedure may

Table I—Observations at Stations

Station	Time	Area, Sq. Ft.	Air Velocity, Ft. per Min.	Temperature, Deg. F.		Difference of Level, Ft. (Base-Station Datum)	Traveling Barom., In. of Mercury	Remarks
				Dry Bulb	Wet Bulb			
	A.M.							
1	9.32	102.3	410	69.0	62.0	0.0	30.576	Beginning of intake
2	10.03	81.2	496	69.0	63.0	+54.5	30.502	
3	10.21	66.9	405	70.0	64.0	−61.5	30.477	
4	10.46	56.7	675	72.0	66.0	+61.7	30.455	Water gage observed at regulator between 4 and 5 = 0.775 in.
5	11.18	58.5	660	73.0	66.0	+62.1	30.276	
6	11.39	66.6	595	72.0	66.0	−58.5	30.365	Water gage observed at separation doors between stations 1 and 7 = 2.150 in.
7	11.51	81.3	500	72.0	66.0	−6.7	30.401	
	P.M.							
1	12.26	102.3	410	70.0	62.0	0.0	30.565	

be varied, for the measurements can then be taken at each point simultaneously, thus obviating the need for a close observation on fluctuations of atmospheric pressure. When this procedure is adopted, and when aneroids are to be used at both points, the instruments must, of course, be taken underground and left near the respective points at least a full day prior to the measurement being made. Where a survey of the complete ventilation system is desired, the work may occupy a week or more.

The program would be divided into sections, each accomplished in a day's work; for example, shafts, main airways, air splits, etc. Each day, work would commence from and check back on a convenient base station. On the completion of the survey, and the calculation of the results, the regions of high pressure or air loss, or both, will be indicated. It may then be necessary to supplement the measurements in the immediate vicinity of these regions in order to locate more definitely the cause, and to study remedial steps more carefully from technical, economic and practical points of view.

Experience in underground air-pressure surveying has shown that when atmospheric conditions are fluctuating rapidly it is futile to attempt this work. Calm or moderately calm weather, and during the night shift, or at week-ends when the mine traffic is at its minimum, is the most favorable time for conducting an air-pressure survey. It is also essential that variations in the speed of the mine ventilator be avoided during the survey and that the underground air-distributive appliances — that is, doors, etc.—remain undisturbed.

When I commenced this work, a base station on the surface, near the downcast shaft, was regarded as an ideal place. Experience soon indicated that such a choice was hopeless, altogether apart from the inconvenience in checking back. Large variations of the atmospheric conditions in a shaft may occur quite independently of surface changes. It is preferable, therefore, to select a base station as near as possible to the district to be surveyed.

Though some of the necessary precautions in the use of aneroids have already been stated, a few additional matters should be kept in mind. The course of the traverse should be so chosen that sudden changes in ventilating pressure are avoided as far as practicable. In traversing, it is always advisable either to follow the direction of the air flow or travel against it throughout the whole of the day's survey; by so doing, the pressure differences are built up slowly and in the same direction. When passage through separation doors is unavoidable or when steep measures are being traversed, sufficient time has to be allowed for the aneroid to adjust itself to the quick change in pressure.

Table II—Pressure Measurements

Station	Time	Pressure Measurements — Inches of Mercury								Remarks
		Base Barometer	Traveling Barometer	Corrections of Traveling Barometer for				Corrected Traveling Barometer	Pressure Loss Between Successive Stations	
				Variation of Base Barometer	Difference of Level	Difference of Temperture	Velocity Pressure			
	A.M.									
1	9.32	30.568	30.576	0.000	0.000	0.0000	+0.001	30.577	0.000	Total loss between stations 1 and 7: 0.159
2	10.03	30.566	30.502	+0.002	+0.059	0.0000	+0.001	30.564	—0.013	
3	10.21	30.565	30.477	+0.003	+0.066	—0.0006	+0.002	30.547	—0.017	
4	10.46	30.563	30.435	+0.005	+0.067	—0.0024	+0.002	30.507	—0.040	
5	11.18	30.560	30.376	+0.008	+0.067	—0.0024	+0.002	30.451	—0.056	
6	11.39	30.558	30.363	+0.010	+0.063	—0.0024	+0.002	30.436	—0.015	
7	11.51	30.557	30.401	+0.011	+0.007	—0.0024	+0.001	30.418	—0.018	
	P.M.									
1	12.26	30.555	30.563	+0.013	....	—0.0006	+0.001	30.577	+0.159	

Lastly, an aneroid indicates the true *static* pressure of the air only when adequately sheltered from the effects of wind. Where the air velocity exceeds 500 ft. per minute, the instrument should be sheltered, therefore, from the air current. When it is in a box, and embedded in cotton or wood wool, that protection will suffice. Should the aneroid be directly exposed to a high velocity, not only will it measure the *total* air pressure incorrectly but it will indicate a pressure which is *less* than the true *static* pressure in consequence of the suction effect set up by the air flowing past the small aperture in the aneroid through which pressure is communicated. Furthermore, this error will be the greater the higher the velocity of the air.

Another point worthy of mention is that relating to the checking of results. In the practice of ordinary surveying, the surveyor seeks to obtain several checks on the accuracy of his work. The same applies to air-pressure surveying. Wherever the opportunity presents itself, water-gage readings should be taken; for example, at separation doors. Such measurements increase confidence in the results obtained, because the pressure difference thus indicated is determined by a fundamental method.

Prof. Briggs well summarized the practical value of air-pressure surveys in an article,* and this need not, therefore, be repeated here. Admittedly, much careful work must be done if an air-pressure survey is to have a successful issue, particularly when a complete air-pressure survey of the mine is to be made. Nevertheless, when it is made with care and completeness, its results are analyzed and the indications followed by action where necessary, the work will more than pay for itself by its value in effecting a scientific and economic control of the mine air flow. Many mine bosses *suspect* that excessive losses are occurring at certain points in the ventilation system. Measurement would, in many cases, provide the proof. As soon as the losses of ventilating power are expressed in terms of dollars, the mine officials concerned will doubtless be ready to devise means for obtaining immediate and lasting improvement in ventilation, actuated thereto by a desire for both safety and economy.

*"Studying Air-Pressure to Cut Fan Costs"—*Coal Age*, Vol. 36, p. 253.

The following corrections are necessary for aneroid readings:

1. *Potential Pressure*—Where two stations are at different levels, a portion of the total air pressure at the lower station will be due to that difference. Consequently, before the actual ventilating pressure which is expended between the two stations can be determined, allowance must be made for this difference of pressure. Many formulas have been elaborated for this purpose; most of them, however, are complicated and cumbersome. When the two stations under consideration are not too far apart and when the difference of level is not too great, the simplest method, and perhaps the most accurate possible under mining conditions, is to determine the mean air density between the two stations. For this correction it usually will be sufficient to take the average of the measurements made at each station.

Fortunately, in America the gradients in mines usually are quite easy, so that, in general, the corrections necessary for differences of level between successive stations should be capable of accurate and easy determination. But it must be emphasized that where such differences in level exceed 2 ft., corrections must be made.

The density of air is determined from the barometric and hygrometric observations, with the help of tables. Jones' tables are perhaps the most useful for this purpose. One commonly used formula in this connection is:

$$w = \frac{1.3253\,(B - 0.378P)\ \text{lb.}}{459 + t}$$

where w = weight of a cubic foot of air; B = barometric (or static) pressure in inches of mercury; P = pressure of water vapor, also in inches of mercury; and t = air temperature in degrees F. It will be noted that tables

Table III—Summary of Results

Station	Quantity Passing, Cu.Ft. Per Min.	Quantity Difference Between Successive Stations, Cu.Ft. Per Min.	Pressure Loss Between Successive Stations, In., Water Gage	Remarks
1	41,940	....		....
2	40,300	—1,640	0.18	....
3	37,450	—2,850	0.23	....
4	38,300	+ 850	0.54	Water gage measured at regulator between stations 4 and 5: 0.75 in.
5	38,600	+ 300	0.76	
6	39,600	+1,000	0.20	....
7	41,460	+1,860	0.24	Water gage measured at separation doors between stations 1 and 7: 2.15 in.
1	41,940	....	2.15	

giving vapor pressure are still necessary, however.

If d ft. is the difference of level between the stations, and w lb. the mean air density, then the potential pressure difference between these stations will be dw lb. per square foot. Or, expressed in inches of mercury: Potential pressure difference = dw. in. ÷ 70.65 of mercury. This quantity would be either added to the barometric pressure measured at the higher of the two stations, or deducted from that pressure indicated at the lower one.

For example: Let us consider the observed data at Stations 2 and 3, Table I. From Station 2 to Station 3 there is a rise of 60.8 ft. (d). The density of air at Station 2 is 0.07602, and at Station 3 is 0.07585 (calculated from the barometric and hygrometric observations at the respective stations with the help of hygrometric tables). The average air density between the stations is thus 0.07594 (= w lb. per cubic foot). Since Station 3 is higher than Station 2, it is necessary to add to the barometric reading obtained at Station 3 the mercury column equivalent to the weight of the air column, due to the difference of level before the loss of ventilating pressure between the two stations may be derived. That is, the necessary correction is:

$$\frac{dw}{70.65} = \frac{60.8 \times 0.07594}{w \times 65}$$
$$= +\ 0.066 \text{ in. of mercury column.}$$

2. *Kinetic Pressure*—If the air velocities at the successive stations are equal, or below, say, 500 ft. per minute, this component of the total pressure may be neglected. Otherwise, it is necessary to calculate the kinetic pressure for each station, as the total air pressure is the sum of the potential, static and kinetic values. The approximate value of kinetic pressure is:

$$wV^2 \div 2g \text{ lb. per square foot}$$
$$= wV^2 \div 2g \times 70.65 \text{ in. of mercury}$$

when w = weight in pounds of a cubic foot of air; V = air velocity in feet per second, and g = gravitational constant.

Again let us take the data for Stations 2 and 3 as an illustration in the application of this correction.

Kinetic pressure at Station 2

$$= \frac{w_2 V_2^2}{2g \times 70.65} \text{ in. of mercury}$$
$$= 0.07602 \times \left(\frac{496}{60}\right)^2 \div 64.4 \times 70.65$$
$$= 0.001 \text{ in. of mercury}$$

Similarly, kinetic pressure at Station 3 = 0.002 in. of mercury.

3. *Static Pressure*—The static component of the total air pressure is simply the pressure indicated by the barometer when sheltered from the effects of air velocity. It may require correction for temperature and atmospheric-pressure variations occurring during the survey. Continuing in our use of the observations made at Stations 2 and 3 for illustrative purposes: The temperature correction to be applied to the particular aneroid used for changes ot temperature was —0.006 in. of mercury per degree F. increase. Between Stations 1 and 3 the atmospheric temperature had increased by 1 deg. Thus, the temperature correction necessary to the barometric reading at Station 3, as compared with the base section (our assumed temperature datum line), is —0.0006 in. of mercury.

Again, from the observations of the control barometer at the base (Table II), we find that when the traveling barometer was read at Station 3, the barometric pressure at the base had dropped to 30.565 in. as compared with a reading of 30.568 in. at the commencement of the survey. Hence this difference between the "base" readings (that is, 0.003 in.) must be added to the reading obtained at Station 3. Had the observations at the base shown a *rise* in atmospheric pressure during the interval, the value of such rise would, of course, have had to be subtracted from the reading made at Station 3.

▼

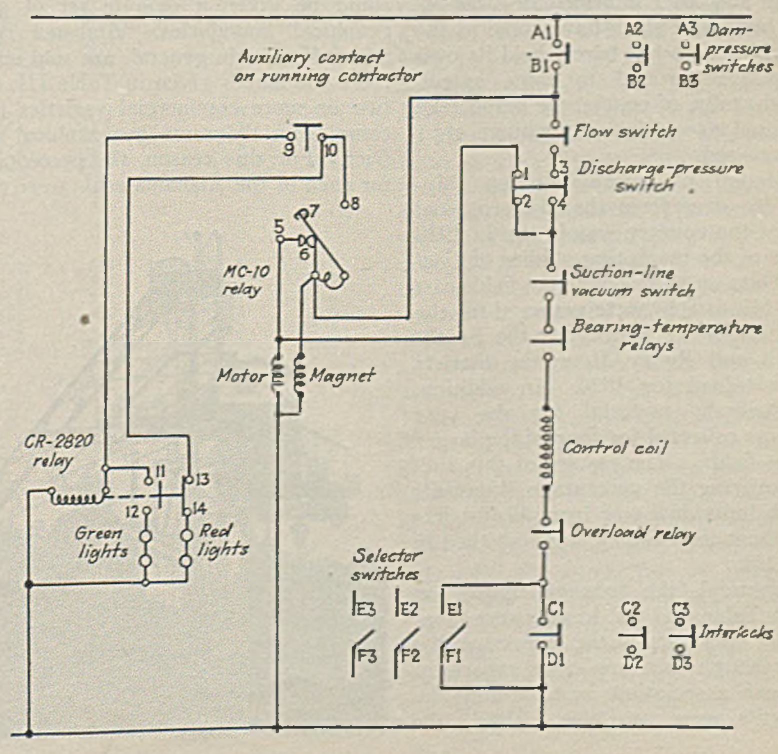
Dual Systems, Electrical and Mechanical, Protect Barnum Pump Station

(Concluded from page 326)

duplicate. In the pumproom the discharge of each pump is provided with piping, so as to enable the pump to discharge through either of the two columns or into both columns at the same time.

Figs. 1 and 2 exhibit the electrical and mechanical layout of the plant, Fig. 2 designating both original and added electrical equipment. The pumps are of Barrett-Haentjens centrifugal type.

Fig. 3—Equipment Added That Pumps May Be Electrically Tended as Well as Electrically Operated



BITUMINOUS COAL

+ Keeps Pace With Market Demands

By Revising Preparation

By IVAN A. GIVEN

Assistant Editor, Coal Age

Table I—Percentage of Sizes Shipped and Sold Locally in the United States in 1930, With Comparative Figures From 1927 Study of U. S. Bureau of Mines, Covering Shipments Only*

	1927†	1930‡
Mine-run and resultants:		
Average, all districts......	48.3	38.8
Average, United States....	50.2	.....
Prepared sizes:		
Lump and block..........	.....	17.6
Grate..................	.....	[1]
Furnace................	.....	1.9
Egg....................	.....	10.8
Stove..................	.....	1.5
Range..................	.....	[1]
Nut....................	.....	2.9
Chestnut...............	.....	0.3
Pea....................	.....	0.3
Average, all districts......	30.7	35.3
Average, United States.....	29.3	.....
Slack, screenings, and other residues:		
Egg-run................	.....	[1]
Nut-run................	.....	0.2
Nut-and-slack...........	.....	6.6
Pea-and-slack...........	.....	0.6
Stoker.................	.....	0.2
Slack and screenings......	.....	18.8
Average, all districts......	21.0	26.4
Average, United States....	20.5	.....

*Before comparing figures in this table, the explanatory matter in the accompanying text should be consulted.
†U.S. Bureau of Mines study, covering shipments only; see text.
‡*Coal Age* study, covering shipments and coal sold locally or to employees; see text.
[1] Very small.

STUDIES made from time to time in the past fifteen years show a marked increase in the production of prepared sizes and slack and screenings, and a corresponding decrease in the percentage of coal shipped from bituminous operations as mine-run. The reasons back of this increase in screening are well known and are based primarily on the desire of the consumer for a coal best suited to his particular requirements. But beyond the general conclusions that the percentages of prepared sizes and slack and screenings have increased, the results of increased screening are not definitely known. It seems evident, however, according to information collected by *Coal Age*, that egg, nut and other intermediate sizes between lump and slack have come to the fore, while lump has barely held its own or has lost ground to some extent. Coincidentally, of course, the percentage of residual sizes (slack, screenings, etc.) has increased.

Collection of information on shipments by sizes from the different coal fields of the country was begun in 1930 as part of the marketing studies of *Coal Age*. Data on shipments from fields east of the Mississippi were gathered for the year 1929, while figures for the Southwestern and Rocky Mountain districts were obtained for 1930. In addition, supplementary material for the year 1931 was collected for four of the larger eastern fields. The results of this survey, covering the percentage shipments of each individual size from 49 districts throughout the country, are embodied in Table III.

In general, the tonnage figures on which Table III is based were supplied by operators in the respective districts, though in a few cases reports of operators' associations or state mine departments were available. While the actual tonnage reported to *Coal Age* varied from district to district, it was in only two cases as low as 20 per cent of the shipments over the year, and in the majority of cases was between 35 and 40 per cent. Including districts for which operators' association or state department reports were available, the total tonnage on which the study is based comprised 40 per cent of the United States shipments in 1930.

In Alabama, a departure was made from the general rule that each district could be given a definite set of geographical boundaries. Alabama commercial coals, in general, are sold under the trade names given in Table III, and two or more commercial varieties may come from the same geographical district. For this reason, the percentages for each of the Alabama coals were confined to the commercial output only, and did not cover captive tonnage, which represents 35 to 40 per cent of the production of the state in normal times, and of course, does not move under any trade name, even though it may in some instances be mined from the same seam and in mines adjacent to commercial producers.

By applying the percentages set forth in Table III to the 1930 shipments and local sales of the respective districts, the average percentages of each of the different sizes for the 49 regions as a whole were obtained. These percentages are shown in Table I, together with the 1927 study of the U. S. Bureau of Mines covering shipments of prepared sizes, mine-run, and slack and screenings. It should be noted that while, as an example, shipments of egg may run as high as 55.8 per cent in an individual district (Table III), egg comprises only 10.8 per cent of the combined shipments of the 49 districts.

Similarly, the average of the other individual sizes, as given in Table I, may be lower or higher than the figures for the individual districts, as set forth in Table III.

In compiling the 1930 percentages in Table I, the figures in Table II were applied to the total commercial shipments from each of the districts, plus coal sold locally or to employees, on the assumption, which apparently is borne out by recent developments, that producers are supplying screened coal in approximately the same proportions on local sales as on railroad shipments. Figures on shipments in 1927 were given by counties in "Coal in 1927," and supplementary averages by districts were given by H. O. Rogers and F. G. Tryon in *Coal Age*, January, 1929 (Vol. 34, p. 30). Where necessary, these district and county averages were recalculated and combined to make them as nearly comparable as possible to the *Coal Age* figures, so that the trend in screening could be observed.

Comparative percentages of mine-run, prepared sizes, and slack and residues, as determined by the Bureau of Mines and *Coal Age* studies, respectively, are given by districts in Table II. In general, this table shows the increasing trend toward greater production of prepared sizes and slack, though in certain districts the mine-run production apparently has increased instead, according to the *Coal Age* study.

Table II—Percentage of Sizes Shipped and Sold Locally by Districts in 1930, With Comparative Figures by the U. S. Bureau of Mines for 1927*

	Mine-Run		Prepared Sizes		Slack and Residue	
	1927†	1930‡	1927†	1930‡	1927†	1930‡
Alabama:						
Big Seam	....	48.1	....	15.5	....	36.4
Black Creek	....	43.5	....	27.9	....	28.6
Carbon Hill	....	8.4	....	33.2	....	58.4
Corona	....	6.9	....	24.2	....	68.9
Cahaba	....	20.3	....	22.7	....	47.0
Montevallo	....	....	....	74.8	....	25.2
Average, all regions	50.7	33.5	32.1	26.5	17.2	40.0
Arkansas:						
Semi-anthracite**	30.1	26.9	46.6	52.1	23.3	21.0
Paris	....	4.1	98.7	81.1	1.3	14.8
Spadra	4.1	....	73.2	74.1	22.7	25.9
Colorado:						
Canon City	6.7	3.5	63.4	70.9	29.9	25.6
Crested Butte	27.9	3.4	53.3	63.1	18.8	33.5
Northern lignite	9.5	4.3	49.8	51.6	40.7	44.1
Trinidad	35.3	7.2	17.4	21.6	47.3	71.2
Walsenburg	24.4	9.4	49.2	53.5	26.4	37.1
Illinois:						
Central	19.3	21.8	54.0	52.6	26.7	25.6
Mt. Olive	30.7	14.2	48.1	61.7	21.2	24.1
Southern	16.4	17.6	52.1	49.5	31.5	32.9
Standard	23.6	27.3	48.2	46.0	28.2	26.7
Indiana	29.2	12.4	44.8	53.2	26.0	34.4
Kansas:						
Cherokee	38.1	18.5	29.3	32.5	32.6	49.0
Kentucky						
Elkhorn	43.3	28.9	33.4	40.3	23.3	30.8
Harlan	21.1	10.0	39.3	48.0	39.6	42.0
Hazard	12.4	14.1	58.0	55.7	29.6	30.2
West Kentucky	34.2	24.4	44.0	45.2	21.8	30.4
Missouri:						
Bevier	45.2	17.7	40.4	62.9	14.4	19.4
Foster, Hume-Worland, Rich Hill	12.2	48.9	54.2	27.5	33.6	23.6
Richmond-Camden	52.3	75.5	41.9	23.8	5.8	0.7
New Mexico:						
Gallup	8.0	....	54.9	64.4	37.1	35.6
Raton	66.9	73.2	23.5	19.4	9.6	7.4
Ohio:						
Hocking	58.9	14.7	28.5	58.3	12.6	27.0
Pittsburgh No. 8	56.7	63.3	27.4	20.7	15.9	16.0
Oklahoma:						
Henryetta	38.5	30.0	38.5	47.5	23.0	22.5
McAlester	84.4	49.6	10.9	32.8	4.7	17.6
Tulsa	73.4	5.8	21.7	67.2	4.9	27.0
Wilburton	69.2	81.8	19.6	13.5	11.2	4.7
Semi-anthracite: (Included with Arkansas semi-anthracite)						
Pennsylvania:						
Cambria-Clearfield	96.4	80.0	1.2	6.0	2.4	14.0
Indiana-Jefferson	83.5	69.0	9.4	13.0	7.1	18.0
Somerset	95.0	84.0	1.9	5.0	3.1	11.0
Connellsville	90.8	94.0	5.2	3.5	4.0	2.5
Pittsburgh	56.3	31.5	26.5	51.1	17.2	18.4
Westmoreland	72.0	71.0	18.8	19.0	9.2	10.0
Utah	12.7	3.6	55.1	54.8	32.2	41.6
West Virginia:						
Fairmont	52.5	54.0	32.1	26.4	15.4	19.6
Kanawha	27.7	8.7	44.6	56.7	27.7	34.6
Logan	34.7	29.0	36.4	34.9	28.9	36.1
Southern low-volatile	49.4	29.9	23.5	29.1	27.1	41.0
Williamson	38.7	13.0	35.0	50.1	26.3	36.9
Wyoming:						
Northern	27.7	16.8	48.0	53.6	24.3	29.6
Southern	97.1	71.4	19.0	14.6	13.9	14.0
Average, all regions	48.3	38.3	30.7	35.3	21.0	26.4
Average, United States	50.2	....	29.3	....	20.5	....

*Before comparing percentages in this table, the explanatory matter in the text should be consulted.
†U. S. Bureau of Mines study covering shipments only; see text.
‡Coal Age study, covering shipments and coal sold locally or to employees; see text.
**Includes Oklahoma semi-anthracite.

As a supplement to the size study, a summary of the different sizes produced in the different districts is offered in Table IV. This table not only includes the individual sizes reported by the operators when they supplied data for the percentage study but also other sizes which were not covered by the percentage study but were separately reported or were included in the sizing standards adopted by certain districts. Consequently, as regards the number of different sizes, as distinguished from percentages of total shipments, Table IV is not comparable with Table III.

In certain districts of the country, notably southern Ohio and the Southwest, two different systems of screening are in use, one based on the production of prepared sizes and slack only and the other making provision for the shipment of mine-run when steam coal is in demand. In Table III, which covers a year's shipments, both types of preparation are represented. Data on domestic preparations in two Oklahoma districts are available, and are given below:

Henryetta District—Domestic Lump Preparation

	Per Cent
Domestic lump (2½-in.)	45
Nut (2½x1¼-in.)	18
Chestnut-slack (1¼-in.)	37

Fancy Lump Preparation

Fancy lump (6-in.)	27
Egg (6x2½-in.)	18
Nut (2½x1¼-in.)	18
Chestnut-slack (1¼-in.)	37

McAlester-Wilburton District—Domestic Preparation

Domestic lump (2½-in.)	55
Nut (2½x1¼-in.)	12
Pea (1¼x¾-in.)	8
Slack (¾-in.)	25

Colorado districts furnish a striking example of the influence of changes in demand on screening practice. In the Crested Butte, Trinidad and Walsenburg regions, Table II shows a marked decrease in the output of mine-run since 1927, due to the action of the railroads in abandoning the use of this size in favor of screenings or resultants, and to the growth in the number of household and industrial stokers. The increase in the use of domestic stokers also has been reflected in the adoption of stoker sizes in a number of other fields in the past one or two years (Table IV, page 338).

Lump, egg, nut and slack apparently are the most popular sizes today from the standpoint of the number made. The multiplicity of sizes of egg and nut is one of the later developments in coal preparation, and represents the efforts of operators to supply sizes to meet any of the demands of more critical buyers. The rise of egg and nut sizes also has influenced the production of lump and slack sizes. While the number of lump and slack sizes, particularly the latter, has risen in response to new market demands, production of a variety of egg and nut coals has in turn necessitated an increase in the number of lump and residual sizes, which represent the upper and lower limits in screening egg and nut.

The influence of railroad demand on sizing is exemplified in the production of modified mine-run and 6- and 4-in. resultants. Railroads prefer, where possible, that the slack content of mine-run be not excessive, which accounts for the practice of removing a certain percentage of the slack in a number of fields. The carriers also fix the upper limits of locomotive coal in many districts, usually at 6 in., though some

Table III—Percentage Shipments of Coal by Sizes

		Resultant		Lump												
	Mine-Run	6-In.	4-In.	8-In.	6-In.*	5-In.	4-In.*	3-In.	2½-In.	2-In.	1¼-In.	1-In.	¾-In.	Unclassified†	Total	
Alabama:[1]																
Big Seam	48.1[2]				4.1[2]			1.2[2]				4.2[2]			9.5	(1)
Black Creek	43.5[2]				14.5[2]							0.7[2]			15.2	(2)
Carbon Hill	8.4[2]				14.8[2]			2.1[2]				0.4[2]			17.3	(3)
Corona	6.9[2]				18.8[2]										18.8	(4)
Cahaba	20.3[2]				17.7[2]			0.6				0.8[2]			19.1	(5)
Montevallo					59.5[2]										59.5	(6)
Arkansas:																
Paris	4.1				60.5										60.5	(7)
Semi-anthracite (includes Oklahoma semi-anthracite)	26.9				41.1										41.1	(8)
Spadra														[6]		(9)
Colorado:																
Canon City	3.5							54.4							54.4	(10)
Crested Butte	3.4			10.1	1.7			31.0[11]							42.8	(11)
Northern lignite[14]	4.3				16.7[15]				18.2					1.9	36.8	(12)
Trinidad	7.2							6.4						8.8[19]	15.2	(13)
Walsenburg	9.4							36.5[11]			1.3				37.8	(14)
Illinois:																
Central[24]	21.8													34.1	34.1	(15)
Mt. Olive[24]	14.2													47.2	47.2	(16)
Southern[24]	17.6													14.4	14.4	(17)
Standard[24]	27.3													22.5	22.5	(18)
Indiana	12.4				6.5		1.0	2.4		5.4	14.8				30.1	(19)
Kansas:																
Cherokee	18.5[33]				2.9									9.7	12.6	(20)
Kentucky:																
Elkhorn	28.5[36]		0.4				19.3								19.3	(21)
Harlan[39]	3.2	4.1	2.7		0.5		26.2			2.5					29.2	(22)
Hazard	0.5	12.0	1.6		1.7		36.3			1.4					39.4	(23)
West Kentucky	21.8	2.6		[6]	15.8			0.7		0.1	3.5				20.1	(24)
Missouri:																
Beaver	17.7				11.1									15.0[45]	26.1	(25)
Foster, Hume-Worland, Rich Hill	48.9[47]				6.4										6.4	(26)
Richmond-Camden	75.5[48]			21.0											21.0	(27)
New Mexico:																
Gallup									0.8		0.3			20.2[51]	21.3	(28)
Raton	73.2				4.0		1.5							1.4	6.9	(29)
Ohio:																
Hocking	14.7						35.3								35.3	(30)
Pittsburgh No. 8	63.3						4.0[57]	3.5			0.1	3.1	2.9		13.6	(31)
Oklahoma:																
Henryetta	30.0								34.1						34.1	(32)
McAlester	49.6								26.8						26.8	(33)
Tulsa	5.8								37.5						37.5	(34)
Wilburton	81.8								9.5						9.5	(35)
Semi-anthracite (included with Oklahoma semi-anthracite)																(36)
Pennsylvania:																
Cambria-Clearfield	80.0[63]													2.0	2.0	(37)
Connellsville	94.0													3.0	3.0	(38)
Indiana, Jefferson	69.0[63]													5.0	5.0	(39)
Pittsburgh[64]	31.5														18.4	(40)
Somerset	84.0[63]													2.0	2.0	(41)
Westmoreland	71.0				0.4	[6]	0.3	2.1		0.1			12.4		15.3	(42)
Utah	3.4[65]	0.2		16.2				3.2							19.4	(43)
West Virginia:																
Fairmont	54.0						5.0			1.0			7.0	3.7	16.7	(44)
Kanawha	21.6	0.2					7.1[72]			2.1			5.7	17.6[73]	32.5	(45)
Logan	19.0						9.0			9.1					18.1	(46)
Southern low-volatile	29.9													8.2[79]	8.2	(47)
Williamson	13.0						26.5			4.2					30.7	(48)
Wyoming:																
Northern	16.8[87]					9.3	0.9							8.2[88]	18.4	(49)
Southern[93]	71.4				2.2									6.6[94]	8.8	(50)

*Harlan, Hazard, Elkhorn, and Williamson 6- and 4-in. coals are designated as 6- and 4-in. "block."
†Includes sizes not specifically described and certain others specifically indicated in the following footnotes.
[1] Based on 1929 report of the Chief Inspector of Mines for Alabama; size designations for Alabama are, in general, as follows: fancy lump, over 5- and 6-in. screens; No. 1 lump, fancy lump and egg, mixed; No. 2 lump, fancy lump, egg, and nut, combined; egg, 6x3- and 5x3-in.; nut 3x1½ or 3x1-in.; slack, 1½x0-or 1x0-in. [2] See Note 1. [3] Furnace (8x2½-in.). [4] No. 4 (2¼x1½-in.). [5] 2½x1¼- and 2¼x1-in. [6] Less than 0.05 per cent. [7] Consists of 6.4 per cent 7x5-in. and 16.2 per cent 7x4-in. grate, and 33.2 per cent 4x2¼-in. egg. [8] Consists of 10.1 per cent No. 4 (2¼x1½-in. stove) and 1.1 per cent range (2¼x⅝-in.). [9] 1½x⅝-in. [10] 1¼-in.

[11] Mostly 3-in. lump, though an undesignated percentage of 5-in. lump is included. [12] Includes 5.0 per cent 8x3-in. egg. [13] 3-in. "nut-run." [14] Includes tonnage compiled by the Northern Colorado Coal Producers' Association for 1930. [15] Consists of both 6- and 4-in. lump. [16] 6x4- and 6x2½-in. [17] 2½x1¼-in. [18] 2½-in. [19] 1½-in. "lump-and-nut." [20] 1½x1-in.
[21] 1½-in. [22] 5x1¼-in. [23] 1¼x¾-in. [24] Based on 1930 report, Illinois Department of Mines and Minerals. [25] Furnace; includes an unspecified percentage of 6x2-in. egg. [27] 2x1¼-in. and 2x1¼-in. [28] 1½x¾- and 1¼x¾-in. chestnut. [29] ¾x⅛-in. [30] Consists of 2-, 1½-, 1¼-, ¾-, and ½-in. slack, and ⅛-in. "carbon."
[31] Consists of 0.4 per cent 6x1½-in. egg; 0.6 per cent 6x1¼-in. egg; 0.1 per cent 4x1½-in. egg; and 2.6 per cent 4x1¼-in. egg. [32] Consists of 5.4 per cent 3x2-in. nut; less than 0.05 per cent 3x¾-in. nut; 0.2 per cent 2x1½-in. nut; 0.5 per cent 1½x¾-in. nut; and less than 0.05 per cent 1¼x¾-in. nut. [33] Includes 15.4 per cent mine-run with 25 per cent of the slack removed (modified mine-run). [34] Includes 0.9 per cent chestnut. [35] Includes 1.5 per cent 3-in. "nut-run." [36] Includes 11.9 per cent "modified" mine-run. [37] 2x1-in. [38] All 2-in. nut-and-slack, with the exception of about 1.0 per cent 1-in. nut-and-slack. [39] Compiled for 1929 by the Harlan County Coal Operators' Association. [40] 2-in.
[41] All 2-in. nut-and-slack except 0.7 per cent 1¼-in. nut-and-slack. [42] Includes a very small percentage of each of six specialty egg sizes. [43] Includes 2.3 per cent 3x2-in. nut and 0.3 per cent 1¼x¾-in. nut. [44] 3-in. [45] Includes 15.0 per cent "railroad lump" (mine-run with ⅞-in. slack removed). [46] "Railroad Egg" (6x⅞-

prefer coal in which the lumps do not exceed 4 in., and from which, in at least one case, all the slack below 1 in. has been removed.

Resultants also arise from the fact that egg, nut and slack are screened out, either for the purpose of making a coarse or "dealer" mine-run, or by reason of the fact there is a comparatively brisk demand for these sizes. Removal of slack for pulverized-coal use is a recent and rather important practice in a number of eastern fields, and frequently brings in its train the pressing problem of disposing of the resultant.

From the Various United States Coal Fields

	Egg							Nut									Slack						
	6 x 3-In.	6 x 2½-In.	6 x 2-In.	4 x 2-In.	Unclassified†	Total	Stove	3 x 1½-In.	3 x 1¼-In.	2½ x 1¼-In.	2 x 1¼-In.	Unclassified†	Total	Pea	Nut-and-Slack	Pea-and-Slack	2-In.	1½-In.	1¼-In.	1-In.	¾-In.	Unclassified†	Total
(1)	2.9[2]					2.9		3.1[2]					3.1					36.4[2]					36.4
(2)	5.8[2]					5.8		6.9[2]					6.9					28.6[2]					28.6
(3)	12.6[2]					12.6		3.3[2]					3.3					58.4[2]					58.4
(4)	4.2[2]					4.2		1.2[2]					1.2					68.9[2]					68.9
(5)	7.1[2]					7.1		6.5[2]					6.5					47.0[2]					47.0
(6)	9.0[2]					9.0		6.3[2]					6.3					25.2[2]					25.2
(7)		10.1			1.1[3]	11.2	5.7[4]					3.7[5]	3.7									14.8	14.8
(8)		3.6				3.6				7.4			7.4						21.0				21.0
(9)					55.8[7]	55.8	11.2[8]					7.1[9]	7.1									25.9	25.9
(10)									16.5				16.5			25.6[10]							
(11)					5.2[12]	5.2			15.1				15.1			3.2[10]			22.2			8.1[13]	30.3
(12)					9.9[16]	9.9						0.2	0.2	4.7[17]					7.1			37.0[18]	44.1
(13)								4.6					4.6	1.8[20]		54.2[21]			7.3			9.7[13]	17.0
(14)					0.9[22]	0.9			13.8				13.8	1.0[23]		30.6[10]			4.7			1.8[13]	6.5
(15)	14.6[25]				2.3[26]	16.9	0.9[27]					0.3[28]	0.3	0.4[29]								25.6[30]	25.6
(16)	9.3[25]				2.3[26]	11.6	1.7[27]					0.7[28]	0.7	0.5[29]								24.1[30]	24.1
(17)	16.5[25]				9.5[26]	26.0	4.3[27]					3.2[28]	3.2	1.6[29]								32.9[30]	32.9
(18)	16.0[25]				3.2[26]	19.2	3.6[27]					0.6[28]	0.6	0.1[29]								26.7[30]	26.7
(19)	7.8		2.2		3.7[31]	13.7			0.3		3.0	6.1[32]	9.4				16.3	1.1	16.1		0.9		34.4
(20)	0.6					0.6						19.3[34]	19.3						2.9			46.1[35]	49.0
(21)				20.3		20.3	0.7[37]								30.8[38]								
(22)				18.8		18.8									42.0[40]								
(23)	1.4			14.7		16.1					0.2		0.2		19.4[41]		10.8						10.8
(24)	11.0		0.6		[42]	11.6			7.9		2.3	3.3[43]	13.5		0.2[40]	3.7	0.1		18.4			8.0[44]	26.5
(25)		1.3			32.2[46]	33.5				3.3			3.3									19.4	19.4
(26)												21.1	21.1									23.6	23.6
(27)					2.5[49]	2.5						0.3[50]	0.3							0.7			0.7
(28)							15.8[52]					27.3[53]	27.3							35.6			35.6
(29)	3.6					3.6		6.0					6 0	2.9[54]								7.4[55]	7.4
(30)				22.6		22.6						0.4	0.4		27.0[56]								
(31)					4.7[58]	4.7						0.2[59]	0.2	2.2[60]				0.1		4.5		11.4	16.0
(32)					3.6	3.6				9.8			9.8						22.5				22.5
(33)										6.0			6.0						17.6				17.6
(34)										28.7		1.0[61]	29.7									27.0	27.0
(35)												4.0[62]	4.0								4.7		4.7
(35)																							
(37)					3.0	3.0						1.0	1.0									14.0	14.0
(38)					0.5	0.5																2.5	2.5
(39)					6.0	6.0						2.0	2.0									18.0	18.0
(40)																						18.4	18.4
(41)					2.0	2.0						1.0	1.0									11.0	11.0
(42)	0.8			0.1	2.8	3.7															9.3	0.7	10.0
(43)							21.2[66]					14.2[67]	14.2								4.9	36.7[68]	41.6
(44)				5.7[69]		5.7						4.0[70]	4.0		6.1[71]							13.5	13.5
(45)				12.4[74]		12.4	1.3					2.4[75]	2.4		21.3[76]							8.3	8.3
(46)				17.9		17.9						3.8[77]	3.8		15.4[78]							25.8	25.8
(47)					10.5[80]	10.5	6.7[81]					3.7[82]	3.7		15.0[83]	0.5[84]						25.5[85]	25.5
(48)				15.8		15.8	0.8				2.8		2.8		36.9[86]								
(49)					20.8[89]	20.8						9.8[90]	9.8	4.6[91]				6.7		2.2		20.7[92]	29.6
(50)					2.7[95]	2.7						3.1[96]	3.1					5.3				8.7[97]	14.0

in.). [47] Includes 6.4 per cent "Modified" mine-run, or railroad coal (⅞-in. slack removed). [48] Includes 67.6 per cent "8-in. screenings." [49] 8x2-in. [50] 2x1-in.

[51] Consists of 8-, 6-, and 4-in. lump. [52] Consists of 8x2, 6x2-, and 4x2-in. stove. [53] Consists of 17.8 per cent "engine coal" (4x1-in.); 0.5 per cent 2x1-in. nut; and 9.0 per cent 1½x1-in. chestnut. [54] 1½x1- and 1½x¾-in. [55] 1- and ¾-in. [56] 2-in. [57] Contains a small percentage of 6-in. lump. [58] Includes a small percentage of 4x1¼-in. egg. [59] 2x1-in. [60] 2- and 1¼-in.

[61] 1¼x½-in. chestnut. [62] Consists of 2.9 per cent 2½x1½-in. nut and 1.1 per cent 1½x¾-in. chestnut. [63] Includes straight mine-run and resultants left after screening out prepared sizes and slack. [64] Remaining per cents not shown include a number of sizes of egg, nut, and specialty coals which cannot be assigned to any definite classifications. [65] Includes 0.5 per cent 8-in. mine-run. [66] 8x3-in. [67] 3x1⅜-in. [68] Consists of 5.7 per cent 3-in. "nut-run" and 31.0 per cent 1⅜-in. slack. [69] Includes some 4x1-in. egg. [70] Mostly 2x¾-in.

[71] 2- and 1½-in. [72] Includes an unspecified percentage of 5-in. lump. [73] Includes 0.1 per cent 2¾-in. lump. [74] Includes some 5x3-in. egg. [75] Includes 2.3 per cent 2x1-in. nut and 0.1 per cent 2½-in. nut. [76] All 2-in. [77] 2x1-in. [78] 2-in. [79] 7½- to 5-in. [80] 7½x2- to 5½x2-in.

[81] 2½x1-in. [82] Small nut, combining what formerly was known as small nut (1x½-in.) and pea (½x¼-in.). [83] 1-in. [84] ½-in. [85] ¼-in. [86] Consists of 2- and 1¼-in. nut-and-slack, and 15.0 per cent "stoker" coal, corresponding to 1½-in. slack. [87] Includes 2.0 per cent "egg-run" (5x0-in.). [88] Includes 0.3 per cent 9-in. lump. [89] Includes 7.3 per cent 5x3-in. egg; 3.7 per cent 5x2½-in. egg; 2.6 per cent 5x1½-in. "egg-nut"; and 0.6 per cent 4x1¼-in. "egg-nut." [90] Includes 4.4 per cent 3x1½-in. nut and 0.3 per cent 2½x1½-in. nut.

[91] 1½x1-in. [92] Includes 5.7 per cent 2½-in. slack. [93] Includes tonnage for 1930 compiled by the Southern Wyoming Coal Operators' Association. [94] Consists of 8- and 3-in. lump. [95] Consists of 2.2 per cent 8x3- and 8x1⅝-in. egg, and 0.5 per cent 4x2½-in. egg. [96] 3x1⅝-in. nut. [97] 1⅝-in.

Table IV—Sizes Produced in the Different Coal Fields of the United States*

(Designationsi n the following table are in inches. Sizes comprising more than 5 per cent of the shipments in each field are shown in *italic* type)

	Mine-Run and Resultants	Lump and Block	Grate	Furnace	Egg	Stove	Range	Nut	Chestnut	Pea	Egg-Run	Nut-Run	Nut-and-Slack	Pea-and-Slack	Stoker	Slack
Alabama	*Mine-Run*	6[1], 5[1], 3[2], 1½[3], 1[3]	....	....	*6x3*, 5x3	....	....	*3x1½*, 3x1	....	....	....	....	....	....	....	1½, 1
Arkansas—Bernice	....	....	7½x4½	7½x2½	4½x2½	2½x½[4]	....	1½x¾	1x¾	¾x⅜	....	....	....	....	....	....
Paris	Mine-run	8, *6*	....	8x2½	*6x2½*	....	....	2½x1½	1½x½	....	....	....	....	....	....	2½, 1½, ½
Spadra	....	14x7	7x5, 7x4	....	5x2½, *4x2½*	2½x1½[4]	2½x¾	*1½x¾*, 1½x¾	1x¾	¾x⅜	....	....	....	....	....	¾, ⅜
Semi-anthracite†	*Mine-run*, R.R.[5]	10[1], 8[1] 7, *6*	....	10x2½	6x2½	....	....	*2½x1½*	....	....	....	....	....	....	....	*1½*, ¾
Colorado—Canon City	Mine-run	*3*	....	....	....	....	....	*3x1½*	....	....	....	....	....	*1½*	....	1½
Crested Butte	Mine-run[5]	*8*, 6, 5, *3*	....	....	*8x3*	....	....	3x1½	....	....	....	3x0	....	1½	....	1½
Trinidad	*Mine-run*, Stoker[6]	*3*, 1½[7]	....	....	....	....	....	3x1½	....	1½x1	....	*3x0*	....	*1½*	....	*1½*, 1
Walsenburg	*Mine-run*	*5*, *3*, *1½*[7]	....	5x1½	....	....	....	*3x1½*	....	1½x¾	....	3x0	....	*1½*	....	1½, ¾
Northern lignite	Mine-run	*6*, *4*, *2½*	....	....	*6x2½*, 4x2½	....	....	....	....	2½x1½	....	....	....	....	....	*2½*, *1½*[8]
Illinois	*Mine-run*	*6*, 3, 2	....	*6x3*, 6x2	3x2	2x1½, 2x1½	....	....	1½x¾, 1½x¾	¾x5/16	....	....	....	....	2x5/16, 1½x5/16	*2*, 1½, *1½*, ¾, ½, 5/16[9]
Indiana	*Mine-run*	*6*, 4, 3, 2, *1½*	....	....	*6x3*, 6x2, 6x1½, 6x1½, 4x1½, 4x1½	....	....	*3x2*, 3x1½, 3x¾, 2x1½, 2x1½, 1½x¾, 1½x¾	....	....	....	....	....	....	....	3, *2*, 1½, *1½*, ¾, ½
Kansas	Mine-run, *Modified*[10]	8, 6, *3*	....	8x3	6x3	....	....	3x*1½*	1½x¾	....	....	3x0	....	....	....	*1½*
Kentucky— Harlan, Hazard, Elkhorn	*Mine-run*, *6*, *4*	8, 6, *4*, 3	....	8x4	6x3, 6x2, *4x2*	2x1	....	2½x2½, 2½x2, 2½x1½, 2½x1½, 2x1½, *2x1½*	....	....	....	....	2½, *2*, *1½*, 1	....	....	*2*
West Kentucky	*Mine-run*, Modified, 6	8, *6*, 3, 2, 1½	....	....	8x3, *6x3*, 6x2, 6x1½	....	....	3x2, *3x1½*, 2x1½, 2x¾, 1½x¾	....	....	....	....	2	¾	....	*3*, 2, 1½, ¾
Missouri—Bevier	*Mine-run*, *Modified*[5]	*6*	....	....	6x2½, 6x¾	....	....	2½x1½	....	....	....	....	....	....	....	1½, *1½x¾*, ¾
Foster, Hume-Worland, Rich Hill	*Mine-run*, *Modified*[5]	*6*	....	....	....	....	....	....	....	....	....	....	....	....	....	1½
Richmond-Camden	Mine-run, *8*	*8*	....	....	*8x2*	....	....	2x1	....	....	....	....	....	....	....	1
New Mexico—Gallup	....	8, 6, *4*, 2½, 1	....	....	....	8x2, *6x2*, *4x2*, 4x1[11]	....	2x1, 1½x1	*1½x½*	....	....	....	....	....	....	*1*
Raton	*Mine-run*	6, 4	....	....	6x3	....	....	*3x1½*	....	1½x1, 1½x¾	....	....	....	....	....	*1½*, 1, ¾
Ohio—Hocking	*Mine-run*	*4*, 2	....	....	*4x2*	....	....	2x1	....	....	....	....	*2*	....	....	2, 1½, 1
Pittsburgh No. 8	*Mine-run*	8, 6, 4, *3*, 1½, 1½, *1*, ¾	....	....	*4x2*, 4x1½, 4x1, *3x1*	....	....	2x1	....	....	....	....	....	....	....	1½, *1*, ¾
Oklahoma— Henryetta	*Mine-run*	6, 4[1], *2½*, 1½	....	....	6x2½, 6x1½, 4½x2½	....	....	*2½x1½*, 2½x1½, 2½x1	....	....	....	....	....	....	....	1½, *1½*, 1
Tulsa	*Mine-run*	*2½*	....	....	....	....	....	*2½x1½*	1½x½	....	....	....	....	....	....	*1½*
McAlester-Wilburton	Mine-run, 4	4[1], *2½*, 1½	....	....	....	....	....	*2½x1½*	1½x¾	....	....	....	....	....	....	*1½*, ¾, ½
Pennsylvania—Central	*Mine-run*, See note[12]	6, 5, 4, 2, 1½	....	....	6x3, 6x2, 5x1½, 4x1½, 4x2	....	....	2x¾, 2x¾, 1½x¾, 1½x½, 1½x¾, 1½x¾	....	....	....	....	....	....	....	1½, ¾, ¾[13], ⅜[13]
Pittsburgh	*Mine-run*	6, *4*, 2, *1½*	....	....	6x3, 6x2, *4x2*, 4x1	....	....	See Note[14]	....	....	....	....	....	....	....	2, *1½*
Connellsville	*Mine-run*	4, ¾	....	....	4x2	....	....	....	....	....	....	....	....	....	....	¾
Westmoreland	*Mine-run*	6, 5, 4, *3*, 2½, 2, 1½, ¾	....	....	6x3, 5x3, 4x3, 4x2, *4*, *3*	....	....	¾	....	....	....	....	2	....	....	3, ¾, ½
Utah	*Mine-run*, 5, 6	*8*, 3	....	....	....	8x3	....	3x1¾, *3x1¾*	....	....	3x0	....	....	....	....	1¾, *1¾*
West Virginia—Fairmont	*Mine-run*, 4	*4*, 2, 1½, ¾	....	....	*4x2*, 4x1	....	....	2x¾, 1½x¾	....	....	....	....	2, 1½	....	1x¾	*2*, ¾, ⅜[13]
Kanawha	*Mine-run*	6, 5, 4, 3, 2, 2½, ¾	....	....	6x4, 6x3, *5x3*, 5x2½, 4x3, 4x2½, *4x2*, 4x1½, 4x¾, 4x½, 2½x2	....	....	2x1½, 2x1	....	....	....	....	2½, *2*, 1	....	....	*1*, ¾, ½
Logan, Williamson	*Mine-run*, 4	*4*, *2*	....	....	4x2	....	....	2x1½	....	....	....	....	*2*	....	1½x0	....
Southern low-volatile	*Mine-run*, See Note[12]	7½, 6, 5	....	....	*7½x2½*, *5x2½*	*2½x1*	....	1x½	....	½x¼	....	....	*2*	½	1	½
Wyoming—Northern	*Mine-run*	9, *5*, 4	....	....	9x2½, *5x3*, *5x2½*, 5x1½[15], 4x1½[15]	....	....	*3x1½*, 3x1½, 2½x1½, 1½x1	1½x1	1½x1	5x0	....	....	....	....	*2½*, *1½*, 1
Southern	*Mine-run*, Modified	8, 7, 5, 3	8x3, 7x3, 5x3	8x1½, 7x1½, 5x1½	4x2½	....	....	3x1½, 2½x1½	....	....	....	....	....	....	....	*1½*, *1½*

*Includes sizes covered in the *Coal Age* study of Table III, with the following additional sizes: (1) Sizes included in the screening standards of the va.ious districts, and (2) other sizes separately reported but not included in the tonnage reports on which Table III is based. For these reasons, Table IV is not strictly comparable with Table III in the number of sizes covered. †Includes Oklahoma semi-anthracite.

[1]Fancy lump. [2]No. 1 lump. [3]No. 2 lump. [4]No. 4. [5]Mine-Run with ¾-in. slack removed. [6]Mine-run with slack removed. [7]"Lump-and-nut." [8]Designated "dust." [9]Designated "carbon." [10]Mine-run with 25 per cent of the slack removed. [11]"Engine coal." [12]Includes various resultants shipped as coarse mine-run" and "dealer mine-run." [13]Pulverized coal. [14]Includes a large number of sizes classed as nut. [15]"Egg-nut."

DEBATING DEPLETION—

+ Mining Men Disagree on Methods for Determining Charges

"WHAT constitute fair depletion charges for a coal-mining property and how should these charges be determined?"

A. W. Hesse, mining engineer, Buckeye Coal Co., raised these questions in an article on the May issue of *Coal Age* (Vol. 37, p. 191) and offered five methods for estimating depletion. These methods, he said, "are not new and are given solely for comparative purposes." To these methods, W. I. Kircaldie, associate member of the A.I.M.E., with a background of experience in appraisal work, takes pointed exception, centering his fire on the use of "the sinking fund method of deriving value."

To this, Mr. Hesse retorts that his critic has taken the use of the term too literally and counters with the further answer that his critic has given a wider scope to the use of the formulas cited than was implied in the original presentation.

Below is given in slightly condensed form: (I) Mr. Kircaldie's criticism of the original article, and (II) Mr. Hesse's answer to the points raised by his critic.

I

Mr. Kircaldie says:

I have read with much interest "What Constitutes Fair Depletion," by A. W. Hesse, mining engineer, Buckeye Coal Co., in the May issue of *Coal Age,* and regret that I cannot subscribe to the methods of determination of the value of coal deposits for the purpose of deriving the proper rate of depletion. Having had occasion, during the past ten years, to prepare many briefs on this subject for presentation to the examining engineers of the Internal Revenue Department, I trust the following remarks will be taken in the spirit in which they are offered—to correct an almost universal misconception of the economics of valuation.

Mr. Hesse offers five methods for estimating depletion charges, all of which employ the sinking fund method of deriving value. It is true that the government engineers were definitely instructed to use Hoskold's sinking fund formula for the determination of value, based upon an interest rate of 4 per cent, but this method is entirely foreign to any ever used by any mining or industrial body. By this method an over-all value was established, including surface land, deposits, buildings, machinery, equipment, mine development, and all other property units. By summation of all property units, except the deposits, the value of the deposits was derived by subtraction. For general convenience this may be considered as a logical method of procedure. From a commercial point of view, however, it is subject to severe criticism, for the simple reason that the value of land, buildings, machinery, etc., is subject to an entirely different process from that of the valuation of a mineral deposit.

Another criticism is the fact that for a sinking fund to properly function it is necessary to set aside annually during the period of capitalization a fixed sum of money which with its accrued compound interest will equal the amount determined as the capital value. For such a fund to serve the purpose of amortization the annual amounts so set aside, or deposited, must remain absolutely undisturbed during the entire period considered.

The use of such a formula absolutely ignores the fact that no enterprise not subject to regulatory influence would deliberately set aside any portion of its earnings to be invested at 3 or 4 per cent compound interest when it would have to pay a higher rate for short-term loans or could invest such amounts in much higher interest-bearing securities and, generally, could use its earnings to better advantage in its own business. Any depletion rate determined on this basis is purely theoretical, as it is obvious that amortization cannot be currently accomplished during the period of capitalization, but at a specific future date coincident with the expiration date of the period of amortization.

Current amortization can be effected by the use of Inwood's formula for determining capital value, which does not use the sinking-fund basis, with its objectionable 4 per cent feature, but provides for current amortization by considering a part of each year's earnings should be distributed in part as interest and in part as the coincident present value of the capital amount.

Shorn of all qualifying propositions, value is the result of two economic forces—utility and desirability—and centers upon the satisfaction of human desire in the present moment. In many instances there is a tendency to confuse cost with value and to consider the two terms synonymous. Actual cost may not reflect true value. In general it does not; the sale of a given property may have been made under forced circumstances, or it may have been consummated on the basis of useful value to the seller only, without reference to its true value for the purpose to which it would be put by the buyer. For example, the price paid to a farmer for land known to be underlain by a mineral deposit which he is himself unable to exploit, either through lack of capital or knowledge, does not generally represent the full value of the property, but more often the price at which he is willing to dispose of it on the basis of its utility to him as a farm—which would be far from representative of the true value of the property for mining operations.

The value of a mineral deposit owned in fee may be determined on the basis of relief from royalty obligations where there are established royalty rates, and it is customary for deposits of a similar nature to be recovered under lease agreements in lieu of ownership in fee. Value thus established, however, would apply specifically to the deposit in an undeveloped state and would not reflect its accrued value through developed capacity to earn. In the instance of a developed deposit, value thus established would be only partial and would have to be supplemented by the additional value of the mine development and the created value due to its capacity and readiness to earn. In other words, a developed mine must be considered as improved property and valued accordingly; for the improvements in the mine itself, as distinct from other improvements (such as buildings and equipment), represent the application of engineering skill and the expenditure of time and effort measurable in monetary terms only by the return of profits.

The generally accepted definition of net profit is the balance of gross annual revenue remaining after deduction of all operating costs. But this list of operating costs seldom, if ever, includes interest on investment. Economics is the science of business, and this science recognizes and emphasizes the fact that a part of the gross profit of any enterprise is earned by the capital invested in the plant necessary for recovery and preparation of the product for the market; and that this part of the gross profit must be considered as interest, and not as net profit.

As typical of the analytical process which enables values to be broken down, tested, verified and proved, let us assume the following example representing an existing coal mining property:

Total area of property, acres	1,000
Area of proved deposit, acres	950
Recoverable tonnage in place	4,000,000
Average annual rate of recovery, tons	200,000
Remaining probable life of the deposit years	20
Value of surface land	$5,000.00
Value of physical improvements	100,000.00
Cost of mine development to point of profitable operation	60,000.00
Working capital necessary	50,000.00
Royalty payable for similar deposits	.10
Equivalent annual relief from royalty obligations	20,000.00
Gross realization from sales @ $1.25 per ton	250,000.00
Operating costs — 79% of gross realization	197,500.00
Rate of return sought by this industry	
(a) On physical property, per cent	10
(b) On working capital, per cent	6

What is the fair market value of the mineral deposit and the created value due to capacity and readiness of the developed mine to earn? The first operation is to determine that portion of annual revenue directly attributable to the deposit, representing its earning capacity, viz.,

Gross revenue		$250,000
Expense		
Operating cost	$197,500	
Interest on investment		
$100,000 @ 10%	10,000	
$50,000 @ 6%	3,000	210,500
Earning Capacity		$39,500

The maximum amount a prudent investor would pay for an annuity of $39,500 for 20 years, with expectation of a return of 10 per cent during the period, combined with the necessary provision for amortization of the capital sum, and attributable to the deposit, is $336,285 (this amount would include the cost of development).

The created value resulting from readiness and capacity to earn will be the difference between this amount and the capital value of an apparent income of $20,000 resulting from ownership in fee, and not subject to royalty obligations. The present worth of $20,000 per year for 20 years, by the same formula, is $170,270, and the created value resulting from capacity to mine is, therefore, $166,015 (which includes $60,000 mine development).

The unit rate of depletion, which remains constant throughout the remaining life of the deposit, is $\frac{\$336,285.00}{4,000,000}$ or 8.4c. per ton.

To exemplify the functions of Inwood's formula the following partial solution is given.

Capital sum at first year		$336,285.00
Revenue for first year	$39,500.00	
Interest at 10% on capital	133,628.50	
Applicable to redemption of capital		5,871.50
Capital balance, interest bearing		330,413.50

This process carried on for 20 years will show that the annual net profit of $39,500 capitalized at $336,285 will cover both interest and amortization charges annually and concurrently with production. In other words, a portion of the original investment is returned each year and is therefore available for reinvestment; this is not possible when the capital value is computed by a sinking-fund formula.

It is important to emphasize the fact that the sum of $39,500 is only an apparent net profit. In reality only $33,628.50 may be so considered, the balance of $5,781.50 being a return of capital; and as the interest charges diminish through the effluxion of time, the annual proportional return of capital will increase. By the use of this formula and its resultant operation it will be observed that every dollar derived from the operation of the mine is liquid, and not partially frozen, as it would be if its amortization were effected through a sinking fund.

II

And Mr. Hesse replies:

As stated in my article, the five methods presented were given merely for comparative purposes and not advocated as the last word in establishing depletion rates; neither, should I say, does Mr. Kircaldie's method prove an unfailing process whereby a property or coal field can be evaluated and from this evaluation establish a depletion rate.

Mr. Kircaldie attacks the use of the "sinking-fund" formula. Apparently the term has been taken to mean literally that the money set aside for depletion reserves must be allowed to remain, perhaps in a trust fund or savings account, at a rate of interest to be compounded at certain intervals. Not necessarily. The Treasury Department does not attempt to control the use of any company's depletion reserves, but it does expect any return thereon to be reported with other proceeds for taxation.

In my previous article, the use of the term "sinking fund" was intended to convey the meaning that provision was to be made for the extinction of the debt for the coal field or the return of the investment, using its actual cost or the enhanced value based on the first cost. In the first, or Crane-Graton, method proposed, I did show a valuation obtained from a hypothetical earning that would come from a present worth having an 8 per cent return, plus an additional amount which, reinvested at 4 per cent interest compounded annually, would return that present worth in 30 years. This method, as well as the others presented, is intended to solve the depletion rate for coal only, whereas, if I understand his example correctly, Mr. Kircaldie combines value of surface, physical improvements and coal, for extinction by his 8.4c. per ton. In 20 years' time, surface need not be amortized; plant and equipment will need replacement, requiring capital out of reserves. Meanwhile the coal field is being wasted and the money should go either to the stockholders as redeemed or used for purchase of additional acreage. In other words, the amortization should be separated.

Take Mr. Kircaldie's example (see Table I). The value has been established in that example at $336,285, but there is nothing left in the "gross realization from sales" to provide for amortization of physical improvements; therefore my conclusion that these amounts are included in the above column, "returned capital." It is very seldom that the rate one should use for depreciation on plant and equipment can be applied to the coal field.

(1) Let us use Mr. Kircaldie's data and apply to the Crane-Graton method:

Gross realization from sales	$250,000
Less operating costs	197,500
Net operating profit	$52,500

Present worth of the net operating profit on the basis of 10 per cent and 4 per cent is $7.48615 \times 52,500 = \$393,022.87$.

Value of surface	$5,000.00
Value of improvements	100,000.00
Working capital	50,000.00
Leaving a value for coal and development	$238,022.87
or cost per year (20 years)	11,901.14

This cost, compared to $52,500, equals 22.67 per cent and becomes the fixed proportion of the profits for tax exemption. Note that the unit rate of depletion, for coal only, amounts to 5.95c. per ton on the annual rate of recovery of 200,000 tons per year.

Suppose each advocate had just opened his property in 1930, and each of the preceding two methods had been adopted, then for 1932 the Kircaldie depletion would be only $7,104.51 total, as against the $11,901.14 of the Crane-Graton method for coal, both having the same operating profit. So, it is a matter of guessing which will be the lean years and which the prosperous ones at the time of inaugurating a rate to get the most satisfactory results.

Let us apply Mr. Kircaldie's data to the other methods presented in my article:

(2) Assuming the cash paid for the coal field, from the royalty paid on similar deposits of coal at the figures obtained by Mr. Kircaldie, $170,270, we get

Depletion rate

$$= \frac{(.10 \times 170270) + (.03358 \times 170270)}{200,000}$$

$= .1137$, or 11.37c. per ton.

(3) Using Kircaldie data, the price per acre is $\frac{170270}{950} = \$179.23$. Recoverable tons per acre equal $\frac{4,000,000}{950} = 4210$ and

$$\text{Depletion rate} = \frac{179.23}{4210} \times \frac{(1.10)^{20} - 1.10}{.10 \times 20}$$

$= .0426 \times 2.813 = .1198$, or 11.98c. per ton.

(4) Depletion rate =

$$\left[170270 \times (1.10)^{20} \times \frac{.04}{(104)^{20} - 1}\right] \div 200,000 = \frac{1,145,406.29 \times .03358}{200,000} =$$

.1923, or 19.23c. per ton.

(5) $$\text{Depletion rate} = \frac{179.23\ (1.10)^{\frac{20}{2}}}{4210}$$

$$= .0426 \times 2.594$$
$$= .1105, \text{ or } 11.05c.$$

per ton.

Suppose that the owner of a property could convince the Treasury Department that any one of the methods herein presented was justified and applicable for the return of the true value of his property, which would he select?

In conclusion, may I say that the rate of 4 per cent interest compounded annually may be defended for its measure of the amount to set aside for depletion reserves, on the results of investigations made by Wm. J. Meyers, who found from a great array of railway statistics during the heyday of railroads that by "combining the figures for shareholders' interests with those for funded debt (bonds) we get a mean rate of annual return on all securities of 4.256 per cent." If one take into account the losses sustained on high-rate securities and combine with those that continue to pay, he will find himself lucky if, over a long period of years, the rate is even as high as given by Mr. Meyers.

Table I

Years	Earnings		Interest on Remaining Investment		Returned Capital or Sinking Fund	Remaining Capital
						$336,285.00
1	$39,500	—	$33,628.50	=	$5,871.50	330,413.50
2	39,500	—	33,041.35	=	6,458.65	323,954.85
3	39,500	—	32,395.49	=	7,104.51	315,850.34

Table continues on through the 20 years.
The above earnings do not contain the 10% on $100,000 and 6% on $50,000.

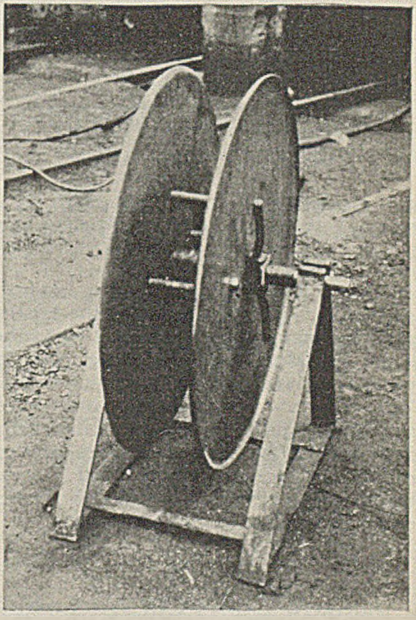
OPERATING IDEAS

From Production, Electrical and Mechanical Men

Portable Installation Reel Prevents Cable Injury

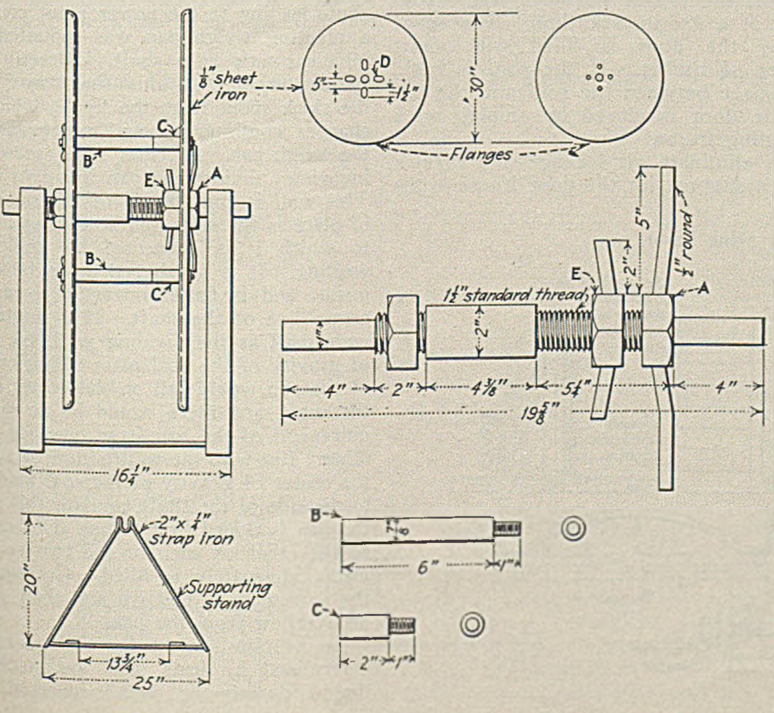
To prevent damage in installing cables on gathering locomotives, portable reels are employed at mines of the West Virginia Coal & Coke Corporation. When installing cables by hand from coils laid on the ground or held by the electrician, it was found that they frequently were spooled onto the reel in a strained position, due to the distortion of the natural coils. This resulted in injury to the wire strands, which, in several instances, materially shortened the life of the cables in service. To eliminate injury, the reel shown in the accompanying illustrations was developed by W. H. Cooke, chief electrician.

In placing the cable on the reel preparatory to installing it on the locomotive, the reel itself is lifted out of the supporting stand, and one flange is removed by unscrewing the outside wing nut, *A*. The cable is then dropped over the pins *B*, the flange is replaced, and the reel and cable is lifted onto the supporting stand. To accommodate both Jeffrey and Goodman cables, which differ in thickness, two sets of pins (*B* and *C*) are used. When the thinner cable is to be installed, the small wing nuts on the pins *B* are loosened, and they are slid to the outside of the slots *D* in the flange. The inner wing nut *E* is then run down against the shoulder of the bolt, after which the cable is placed over the pins and the flange carrying the short pins *C* is put in place. When the reel is assembled, the pins *C* are inside pins *B*.



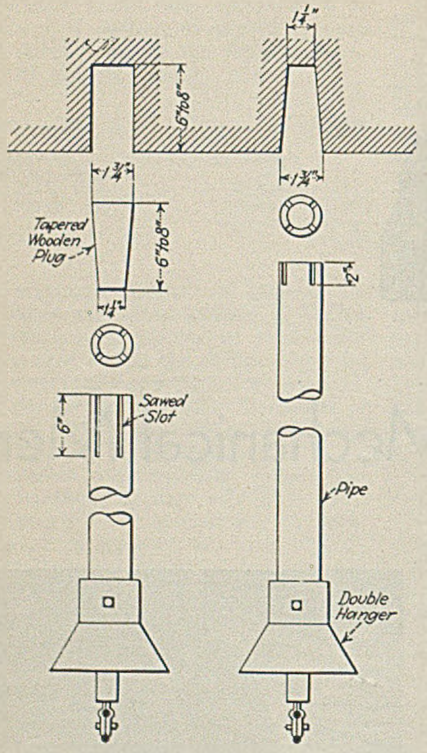
Reel Assembled for Thin Cable

Construction Details, Portable Cable Reel



Slotted Pipe Hanger Extensions Solve High Roof Problem

Use of a slotted pipe in conjunction with a tapered wooden plug or a tapered hole in the roof has been adopted by the West Virginia Coal & Coke Corporation for hanging trolley wire where the roof is high. The two methods in use are shown in the accompanying illustration. In the one case, four slots 6 in. long are



Installation of Pipe Extensions. Left, With Tapered Plug; Right, With Tapered Hole

sawed in the end of the pipe, and the slotted end is driven up over the tapered plug to make a tight fit. In the other case, the slots are 2 in. long, and the pipe is driven up into a tapered hole. The resultant collapsing action wedges the pipe tightly in place. After being fastened in the roof, the pipes are cut off at the desired height, and a combination hanger (feeder and trolley wire) is fastened on by a setscrew.

Standard Doors Cut Air Losses And Aid Installation

Adoption of a standard mine door and uniform installation methods are included in the standardization program of the West Virginia Coal & Coke Corporation. In designing the door, reduction in air losses and installation labor, and elimination of attendants were the guiding factors. Door height and door width vary in conformance with conditions at the different mines, but construction and installation is uniform throughout.

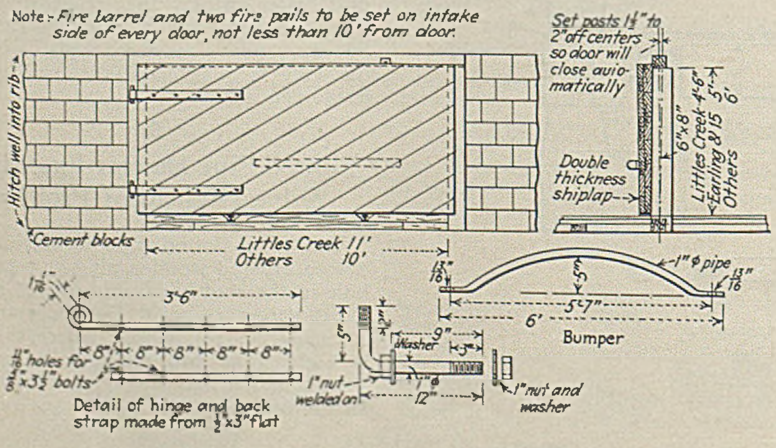
Each door is made of shiplap and is equipped with a pipe bumper. Hinge posts are set slightly off-center so that closing is automatic. Where the roof is low, the top of the door frame consists of a 4x6-in. scantling. The space below the door is filled with short pieces of timber. If the roof is high, the space between the roof and the top of the door is closed by shiplap on a scantling frame.

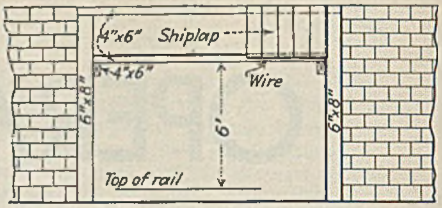
To eliminate air leakage and furnish a firm support for the door frame, walls of concrete blocks are built on either side of the door. These walls are hitched well into the rib and are plastered to cut down leakage. Hinges are 3½ ft. long and are made of ½-in. strap iron, as shown in the accompanying figure.

Solutions Wanted

Problems that crop up in every-day operation of coal mines usually require immediate answers, regardless of their character. Whether it be a safe way of guarding trolley and feeder wires, a signal system for controlling trips, or a quick and economical method of repairing a breakdown, to give but a few examples, on-the-spot solutions are imperative. These pages contain the cumulative experience of mining men who have met and overcome the emergencies that arise in getting out the coal, and offer tried and proved answers for many operating problems. Your idea for saving time and dollars belongs among them. Send it in. A sketch or photograph may make it clearer. Acceptable ideas are paid for at the rate of $5 or more each.

Construction of Standard Mine Door





Method of Installing Doors Where the Roof is High

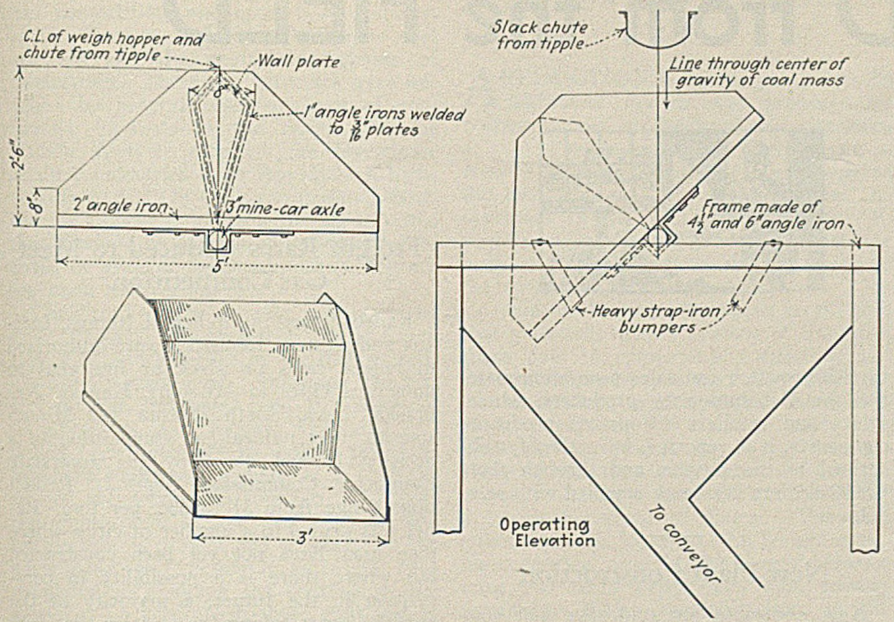
Automatic Weighing Device For Coal

At the Oliver (Colorado) mine of the Oliver Coal Co. a simple weigh pan has been developed for recording the weight of slack delivered from the mine tipple to a conveyor leading to the steam plant of a public utility adjacently located. When the problem of weighing the coal going to this power plant was investigated, writes Ronald C. Oliver, superintendent of the mine, it was found that a satisfactory coal-weighing device could not be purchased for much less than $5,000, a cost which the company considered completely out of line.

Casting about for some substitute, the management found none, either on the market or elsewhere, until C. L. Oliver, president of the company, suggested an idea which subsequently was developed and is now giving satisfactory service. The result was a device which cost about $75 for materials and $30 for labor.

Over a small receiving hopper, with a chute leading to the power plant conveyor, a pivoting weigh pan was mounted on a mine-car axle as a shaft. Directly above the center line of this shaft was placed the slack spout from the tipple, which discharges continuously and unattended into the weigh pan. A center wall (see operating view) divides the pan into two halves. This wall is constructed of the same gage of plate as the sides and bottom of the pan, to which it is connected by angles and welding. It is so shaped as to be hollow inside, and is flared inwardly toward the center line of the shaft. If a single plate were used as the dividing wall, the center of gravity of the coal mass filling one-half of the pan would fall on the center line of the shaft, and there would be no pivoting movement of the pan from one side to the other. But with the wall hollow and flared, the center of gravity of the coal mass falls to the side of the shaft, and for this reason the pan is tipped first to one side and then to the other as each of the two compartments alternately is filled. Consequently, the movement is positive and there can be no overflow from the pan.

An average weight for each dump was determined by tests, and the number of dumps during the day is counted on a



Tipping First to One Side and Then to the Other, This Device Measures Coal Mass Automatically

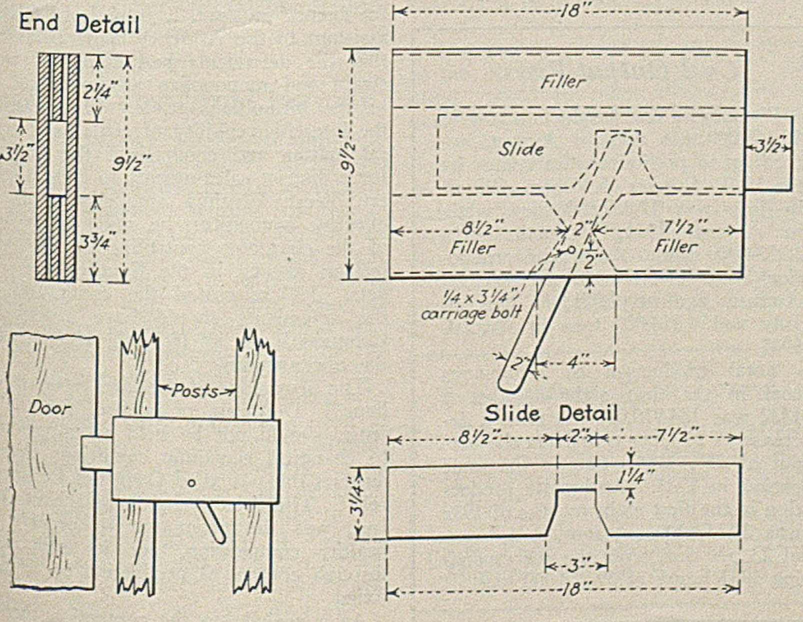
printing-press counter attached by wire to the side of the weigh hopper. The device has been in use for 14 months. Slack measurements through the hopper and through the automatic stokers on the boilers in the steam plant are said to check so closely that all the difference can be assumed to be due to natural shrinkage of the coal while it is in storage.

Door Keeper Promotes Safety

Impromptu use of sticks of wood or lumps of coal or slate in blocking open mine doors while a trip is passing through is a hazard which can be eliminated by the use of a proper form of keeper. Such a keeper, which can be released by the motorman or triprider without getting off the trip, is described by Lloyd Bush, mine foreman, Inland Collieries Co., Indianola, Pa.

Spare brattice lumber is used in the construction of the device in accordance with the detailed plan given in the accompanying illustration. The keeper is nailed to two posts set parallel with the track and sufficient distance away to clear the trip. Being parallel with the door when it is in open position the keeper is easy to release regardless of the direction in which the trip is traveling. The equipment also replaces the button quite commonly used, and which necessitates a man getting off the trip to release the door.

Construction Details, Mine Door Keeper. Also Keeper Shown in Place



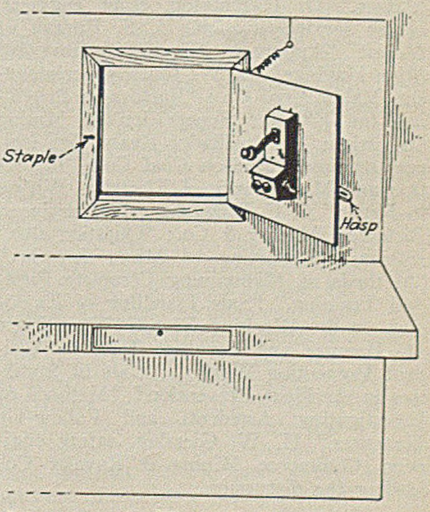
Cool Place Should Be Selected For Storing Rubber Belts

Rubber belts should be stored in a cool place where the temperature is not over 70 deg. F., and where there is a fair amount of humidity, says the B. F. Goodrich Rubber Co., Akron, Ohio. While there should be some moisture present, the company remarks that this does not mean that belts should be stored with one end standing on a wet spot. Direct sunlight and warm air should be avoided wherever possible.

To further protect belting in storage, the company recommends the use of a compound made up of 1 qt. shellac, 1 pt. alcohol, 1½ qt. household ammonia, and 3 qt. water to treat the edges and exposed faces of belts in roll form. One gallon will cover approximatey 300 sq.ft., and can be quicky applied with a whitewash brush. Where belts are not taken down and rolled up, it is urged that the installation be checked to make certain that tension has been removed.

Mine Telephone Is Accessible When Office Is Closed

By installing the telephone on a swinging door, it is possible to lock the dispatcher's office at the Earling mine of the West Virginia Coal & Coke Corporation and still make the phone available to night foremen or other authorized persons. Telephone and door arrangement are shown diagrammatically



Diagrammatic View, Earling Telephone Installation

in the accompanying figure. During the day, the door carrying the telephone is latched back against the wall of the office where it can be reached by the dispatcher. At night, the door is closed and locked with the telephone outside. The telephone line is carried from the wall to the door at a point near the hinges, and a short springlike coil gives sufficient slack to allow closing of the door.

WORD from the FIELD

Safety in Mines to Be Stressed At Washington Congress

All phases of safety in coal and metal mines will be discussed by the Mining Section of the National Safety Council at the annual safety congress to be held at Washington, D.C., Oct. 3-6. Topics scheduled for presentation at the various sessions are as follows:

Tuesday—Inspirational talk on safety, George Opp, Detroit Edison Co.; and the "Lighting of Underground Mines," C. W. Owings, associate mining engineer, U. S. Bureau of Mines.

Wednesday—"Up-to-Date Timbering in Mining," R. Dawson Hall, engineering editor, *Coal Age;* "Outstanding Safety Features Pertaining to Mining and Its Allied Industries in Arizona," William E. Hunter, Industrial Commission of Arizona; "Question Box" session—"Efficient Use of Safety Bulletins," "Methods Used in the Selection and Training of Foremen," "Methods of Checking Men Into and Out of Mines," "Methods Used in Providing Men With Protective Clothing and Devices," with discussion led by P. M. Arthur, director of personnel, American Zinc Co. of Tennessee.

Thursday—"Metal Mine Fires and Ventilation," D. Harrington, chief engineer, safety service division, U. S. Bureau of Mines; "Automatic Signal Systems for Mine Haulage," D. W. Jones, superintendent, Valier Coal Co.; "Factors in Providing for Efficient Supervision of Mining Operations," Cadwallader Evans, Jr., general manager, Hudson Coal Co.; "Inspection and Maintenance of Electrical Wiring in Mines," C. F. Hazelton, safety engineer, Pickands, Mather & Co.; "Question Box" sessions—"Reporting of Minor Injuries," "Methods of Maintaining Complete First-Aid Training," "Safe Handling of Explosives at the Working Face," "What Place Do Bonuses and Penalties Take in Accident Prevention Work?" "Uses of Statistics in Accident Prevention," "Methods of Investigating Accidents and Follow-Up Measures," H. W. Giessing, safety engineer, Commerce Mining & Royalty Co., leading the discussion.

Merchandising Service Offered

Advertising and merchandising service in the sale of solid fuels is offered by Coal Service, Inc., a new nation-wide organization headed by Harry Turner, former assistant to the president and chairman of the public relations committee, National Retail Coal Merchants' Association. Headquarters have been established in Topeka, Kan., with branch offices in New York City; Washington, D. C.; Chicago, and San Francisco, Calif. The organization will specialize in the preparation of advertising matter and sales promotion material for distribution by producers, wholesalers and retailers. Fourteen producing companies, it is reported, have already subscribed to the service, and through them 42,000 dealers are being supplied with sales help.

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations in August were:

Barnes Coal Co., Barnesboro, Pa.; contract closed with the Roberts & Schaefer Co. for coal-cleaning plant equipped with Stump "Air-Flow" coal cleaners for treating 3x0-in. coal; capacity, 360 tons per hour; to be completed Dec. 1.

Lindley Coal Co., Houston, Pa.; contract closed with the Morrow Mfg. Co. for four-track steel tipple equipped with weigh pan, feeder, shaker screens, rescreen conveyor, loading booms and reassembling conveyor; capacity, 200 tons per hour; to be completed about Oct. 1.

Pittsburg & Midway Coal Mining Co., West Mineral, Kan.; contract closed with the Roberts & Schaefer Co. for combination wet and dry cleaning plant, wet end to consist of Wuensch cone equipment for preparing 6x¾-in. coal, dry end to employ Stump "Air-Flow" coal cleaners for ¾x0-in. coal. Capacity of the plant will be 300 tons per hour; probable date of completion is Nov. 1.

Coal Output Rises

Bituminous coal production rose to 22,465,000 net tons in August, according to preliminary estimates by the U. S. Bureau of Mines. Output in July was 17,857,000 tons, while in August, 1931, production was 30,534,000 tons. Anthracite production rose to 3,470,000 net tons in August, against 3,021,000 tons in July and 4,314,000 tons in August, 1931.

Total production of bituminous coal in the first eight months of 1932 was 184,910,000 net tons, a decrease of 26.1 per cent from the output of 250,121,000 tons in the same period in 1931. Anthracite production in the first eight months of 1932 was 30,653,000 net tons, a decrease of 23 per cent from the corresponding 1931 figure of 39,810,000 tons.

Freight Rates Reduced to Meet Gas Competition

Railroads serving mines in Illinois, Indiana and western Kentucky were authorized to reduce rates on slack or fine coal to numerous cities in Missouri, Kansas, Nebraska, Iowa, South Dakota and Minnesota to meet natural-gas competition in a decision handed down by the Interstate Commerce Commission, Sept. 2. Reductions range from 31 to 53c. per ton. Relief was denied to a number of cities where pipe lines have not yet been constructed but where there is a possibility of competition in the future, a majority of the commissioners taking the position that they could grant Fourth Section relief only where competition already exists.

Appalachian Coals Hearings End; Early Decision Expected

Decision in the federal government's injunction proceedings against Appalachian Coals, Inc., and the companies and individuals participating in the formation of this district selling agency is forecast for late this summer. The three judges sitting as a U. S. district court for the western district of Virginia, before which hearings on the suit of the Department of Justice were held at Asheville, N. C., last month, in directing counsel to file briefs by Aug. 22, indicated that they would endeavor to hand down a decision in time for either party to appeal to the Supreme Court during the fall term, beginning Oct. 3.

In opening the government's attack on the agency on Aug. 1, John Lord O'Brian, assistant to the Attorney General, asserted that the defendents had combined to restrain and monopolize an important part of the bituminous trade. He questioned the interchangeability of coals as a practical matter and emphasized the proposals for a district sales agency to handle southern West Virginia smokeless, the only effective competitor, he said, of the coals of the character controlled by the Appalachian agency in the Southeastern markets. He reiterated the contention that the defendants should have appealed to Congress for relief from the restrictions of the Sherman law.

The provisions of the law, retorted William J. Donovan, of counsel for the defense, should not be held so unresponsive to changing economic conditions that industries must turn to Congress for specific relief. The objective of Appalachian Coals, Inc., was the promotion of orderly and healthy competition, not its suppression through control of production or by price fixing.

As a prelude to the contention that the

agency violated the Sherman law, government counsel called upon F. G. Tryon, U. S. Bureau of Mines, to build up the statistical background on production and fuel competition, and upon J. F. Barkley, U. S. Bureau of Mines, to discuss coal analyses and the engineering phases of combustion. These two witnesses were followed by several representatives of consuming interests in the South and the Middle West to establish the dependence of their industries upon Appalachian high-volatile coals. On cross-examination, however, a number of these witnesses admitted that it would be possible to substitute other coals, or even oil and natural gas, depending upon relative prices.

The brunt of the defense was borne by J. D. Francis, vice-president, Island Creek Coal Co., and a leader in the district selling agency movement. Outlining the history of the movement and the hopes of its advocates, Mr. Francis explained that it had been necessary to include the eight Southern high-volatile districts to give the agency the scope and tonnage to support the employment of the desired sales and engineering personnel and to carry on the advertising and research activities contemplated in planning the creation of the agency. To accomplish these ends and at the same time not unduly restrict competition it was felt that at least 70 per cent and not over 80 per cent of the commercial tonnage of the districts should participate in the agency. Competition from the smokeless fields and from the non-participating high-volatile tonnage would effectively bar any suppression of price competition. Mr. Francis declared that there was no understanding among members of the Appalachian agency that prices would be increased.

That inter-district competition and the competition of other fuels would prevent the agency from monopolizing trade or controlling prices was a claim further supported by a procession of witnesses, including both members and non-members of Appalachian Coals, Inc., retailers, wholesale distributors, railroads and large industrial consumers. These witnesses all testified that any attempt to boost prices would divert tonnage from the agency group to non-agency producers and other fields and fuels. They all also supported the claim as to interchangeability of fuels.

Hearings closed Aug. 12.

Organize Cumberland Institute

Representatives of sixteen mining companies in Bell, Knox, Laurel, McCreary, and Whitley counties, Kentucky, organized the Cumberland Mining Institute at a meeting at Pineville, Aug. 8, for the purpose of promoting safety work in the five counties mentioned. The meeting was called by John F. Daniel, chief of the Kentucky Department of Mines, who was assisted by representatives of the U. S. Bureau of Mines and the University of Kentucky. Among those who took an active part in the formation of the institute were: F. E. Gilbert, Southern Mining Co., Williamsburg, Ky.; John W. Wright, Stearns Coal & Lumber Co., Stearns; R. W. Liddle, R. W. Liddle & Sons, Arjay; W. B. Greene, Benedict Coal Corporation, St. Charles, Va.; and E. B. Cornett and H. N. Smith, Kentucky Jellico Coal Co., Kay Jay.

Anthracite Operators Ask Wage Reduction; New Union Formed in Illinois

A REDUCTION in the wages of 140,000 anthracite miners was proposed by representatives of the hard-coal operators at a joint wage conference which began in New York City, Sept. 6. The extent of the reduction was not mentioned by the operators in the early sessions, but observers expect that a formal request for a 20 or 25 per cent cut will be made in the course of the deliberations.

Operators based their request on the fact that anthracite wages are out of line with those paid in comparable industries, and have therefore been in part responsible for loss of markets in late years. Union representatives took the stand in early sessions that in spite of the 10 per cent increase in war-time wage rates, the average earnings of miners are still insufficient for a reasonable scale of living. They attributed market losses to high freight rates, high taxation, an excessive spread between mine and retail prices, and high royalty payments. Union representatives, at the start of the conference, denied emphatically that they were planning to make a concession of 10 per cent because they believed that some sacrifice in wages was inevitable.

Climaxing three weeks of opposition to the new Illinois wage agreement, signed Aug. 10 after an "emergency" had been declared by John L. Lewis, president of the United Mine Workers, delegates claiming to represent the "rank-and-file" of 200 locals in the state formed the "Progressive Miners of America" at a meeting in Gillespie, Ill., Sept. 3. This threat to the power of the state and international officers of the United Mine Workers was the latest step in the insurgent campaign against the revised Illinois agreement (*Coal Age*, August, 1932, p. 313), which got under way when plans for a second referendum on Aug. 6 were announced early in the month. Open revolt broke out when the news was broadcast that official tally sheets had been stolen from the tellers in Springfield, Aug. 10, and that, as a result, the agreement had been signed.

The protest movement got under way in the Springfield district Aug. 11. Picketing spread to other districts on succeeding days, and 5,000 miners marched into Christian County Aug. 18, closing down four Peabody Coal Co. mines, two of which reopened later with reduced forces. The insurgents then turned their attention to southern Illinois. Fifteen thousand men from other districts advanced on Franklin County, but were turned back at Mulkeytown, Aug. 24, after a short but fierce battle with deputy sheriffs. Blaming their defeat at Mulkeytown on a mistake in strategy, insurgent leaders gathered at Gillespie Aug. 26 to lay new plans for an invasion of southern Illinois. Out of the series of conferences grew the "Progressive Miners of America." Temporary officers of the new union were empowered on Sept. 3 to enter into temporary agreements with willing operators, such agreements to retain the old basic scale of $6.10 per day. Efforts will be made to extend the new union to other fields, the policy committee indicated. Twenty-two delegates from Indiana assisted in the formation of the new organization.

End-of-the-month reports indicated that 38 mines employing 26,000 men were working in Illinois. Included in the list were most of the state's largest operations in the southern district. Before the stoppage began on April 1, approximately 140 operations were shipping coal.

Negotiations between Indiana operators and miners were reopened on Aug. 12, and were carried on intermittently until Sept. 1, when the operators were reported to have made their final proposals to the men. One proposal was the adoption of the Illinois agreement, with a provision for arbitrating questions affecting division of work. The second proposal was a flat reduction of 25 per cent from the scale included in the old agreement, which expired March 31. Both proposals were to be considered at a miners' convention.

Troops continued to occupy stations in the Indiana coal fields to guard against further attacks on cooperative mines. The Dixie Bee mine of the Eureka Coal Co., Terre Haute, which was closed down by pickets early in the month, reopened with troop protection on Aug. 15. The Hoosier Coal Mining Co.'s cooperative mine at Dugger, the scene of clashes in July, resumed operations on Aug. 22. Other cooperative operations gave evidence of intentions to reopen in the near future.

Sporadic sniping on the part of strikers at mines in the Hocking Valley, particularly the operations of the Lick Run Mining Co. and the Manhattan Coal Co., characterized the Ohio situation in August. Athens County citizens asked that troops, of which 175 remained in the region, be withdrawn, but Governor White refused to accede to the request. There also were a few dynamitings and incendiary fires in some sections of the coal fields, and a number of strikers were arrested from time to time on charges of disorderly conduct or inciting to riot.

Conditions were quiet in the strike areas of Oklahoma and Arkansas at the end of August. David Fowler, international organizer, United Mine Workers, announced at Muskogee that a number of companies in eastern Oklahoma and western Arkansas had signed contracts to expire June 30, 1934, and that union officials would turn next to the Henryetta district of Oklahoma. In general, however, the major operators in both states reiterated their refusal to deal with the union, asserting that past experiences held out little hope

Permissible Plate Issued

One approval of permissible equipment was granted by the U. S. Bureau of Mines in July, as follows:

Joy Bros., Inc.; Type B coal saw; 15-hp. motor, 230 volts, d.c.; Approval 245; July 16.

of peaceful or economic operation under union domination.

A 20 per cent reduction to the $5.42 basic scale established in southern Wyoming a few weeks ago was agreed to by miners in the Hudson and Sheridan fields of northern Wyoming on Aug. 4. Gebo miners approved the same scale a day or two later, and Crosby miners accepted a slightly modified version of the agreement on Aug. 8, ending a stoppage that began July 1 with the expiration of the old agreement.

A contract between the Northwestern Improvement Co., Roslyn, Wash., and the United Mine Workers was signed Aug. 22 by union officials, after the miners had rejected the settlement by a vote of 476 to 409.

Montana miners on Aug. 11 accepted a new wage agreement based on the southern Wyoming settlement by a vote of 667 to 623. The referendum concluded weeks of negotiations.

Glen Alden Building Boiler Plant

A new boiler plant to serve the Stanton and Empire collieries of the Glen Alden Coal Co. is now under construction at the former operation, near Wilkes-Barre, Pa. Equipment will consist of two 500-hp. Heine three-drum bent-tube boilers with economizers; two similar 665-hp. boilers without economizers; and Type C Coxe stokers 12 ft. wide. Steam pressure will be 150 lb. per square inch and 100 deg. of superheat will be carried. No. 2 barley will be used for fuel.

Kentucky Holds First-Aid Meet

Thirty-five hundred people attended the annual State-Wide First-Aid and Mine-Rescue Meet held at Lynch, Ky., Aug. 20, with John F. Daniel, chief, Kentucky Department of Mines, in charge. Forty-seven teams competed in the first-aid events and three teams were entered in the mine-rescue contest. Winners in the first-aid meets were, in order: Harlan-Wallins Coal Corporation team, Ray Campbell, captain; Elkhorn Piney Coal Mining Co., Lewis Bradford; Inland Steel Co., Jesse Belcher; Southern Mining Co., Bryan Harkness; Blue Diamond Coal Co., Bonny Blue, Va., L. E. Rains. The team of the Fordson Coal Co., Stone, Ky., D. C. Osborne, captain, won the mine-rescue contest. The Negro first-aid contest was won by a United States Coal & Coke team captained by Albert Lacey.

Obituary

William E. Henderson, 72, superintendent, Crow's Nest mine, Keystone Coal & Coke Co., died at his home at Greensburg, Pa., Aug. 11. Mr. Henderson went with the Keystone company in 1913 as superintendent of the Bovard and Keystone mines, and before that held positions with the H. C. Frick Coke Co. and the United Coal Co.

William P. Slaughter, 63, president of the Pocahontas Coal Sales Co., Cincinnati, Ohio, died suddenly at Bluefield, W. Va., Aug. 3, of bronchial pneumonia. Mr. Slaughter originally started in the coal business with the Pocahontas Fuel Co., and later was identified with the Thacker Coal Co. In 1905, when the Gilliam interests decided to market their coal directly, he became president of the Glen Alum Fuel Co., and later was chosen to head the Pocahontas Coal Sales Co.

William P. Delaney, secretary, District 26, United Mine Workers, Glace Bay, Nova Scotia, died suddenly at New London, Conn., Aug. 2, while aboard a train en route to New York for a union conference. Mr. Delaney was 51.

E. B. Childers, division superintendent of the Black Mountain Corporation and a member of the executive board of the Harlan County Coal Operators' Association, died Aug. 6 at Kenvir, Ky.

Col. H. W. Coulter, vice-president, Greensburg Coal & Coke Co., Greensburg, Pa., died Aug. 18 at the University Hospital, Philadelphia, Pa. Colonel Coulter was 56. Internal complications growing out of an automobile accident last May caused his death.

Industrial Notes

E. Frost, former general sales manager, Atlas Powder Co., Wilmington, Del., has been appointed director of sales, succeeding the late J. W. Mathews.

Delta-Star Electric Co., Chicago, has opened a new branch office at 2135 Eldred Ave., Cleveland, Ohio, in charge of the H. V. Varney Co.

Simplex Wire & Cable Co., Boston, Mass., has opened a branch office at 321 West Lafayette Boulevard, Detroit, Mich., in charge of Herman C. Joos.

Falk Corporation, Milwaukee, Wis., has appointed L. A. Graham to the position of sales manager. Mr. Graham was lately a consultant to Falk and other companies. M. A. Carpenter, in charge of advertising for the Falk organization, has been made sales promotion manager.

Robins Conveying Belt Co., New York and Chicago, has opened the following new sales offices: 229 Rockefeller Building, Cleveland, Ohio, in charge of Robert Wisely; 16170 LaSalle Avenue, Detroit, Mich., M. S. Lambert; 7146 Dartmouth Avenue, St. Louis, Mo., H. J. Martini; 905 Edgewood Avenue, Charleston, W. Va., R. U. Jackson.

Personal Notes

George W. Craft, Bramwell, W. Va., formerly general superintendent for the Pocahontas Fuel Co., has been placed in charge of the operations of the Killarney Smokeless Coal Co., Killarney, W. Va.

F. W. Braggins, until a few months ago president of the Lorain Coal & Dock Co., Columbus, Ohio, has been made vice-president of the Pursglove Coal Mining Co., with offices in Cleveland, Ohio, and mines in northern West Virginia.

Charles O'Neill, vice-president, Peale, Peacock & Kerr, Inc., New York, has been appointed a representative of the National Coal Association on the national committee for economy in government, a new committee of the National Association of Manufacturers.

W. B. Montgomery, formerly controller for the Colorado Fuel & Iron Co., Denver, Colo., was appointed assistant to the president of the company on Aug. 9. Mr. Montgomery, who was controller for the American Linseed Co., joined the C. F. & I. staff in 1930 as assistant controller.

Rice Miller, vice-president, Hillsboro Coal Co., Hillsboro, Ill., has been appointed a member of the Illinois Commerce Commission, vice Charles W. Hadley, resigned.

Coal Mine Fatalities Rise

Coal-mine accidents caused the death of 58 bituminous and 15 anthracite miners in July, 1932, according to information furnished the U. S. Bureau of Mines by state mine inspectors. This compares with 39 bituminous and 10 anthracite fatalities in June, and 100 bituminous and 21 anthracite deaths in July, 1931. The death rate at bituminous mines rose to 3.25, while the anthracite fatality rate increased to 4.97. Comparative figures are as follows:

Bituminous Mines

	July, 1932	June, 1932	July, 1931
Production, 1,000 tons	17,857	17,749	29,790
Fatalities	58	39	100
Death rate per 1,000,000 tons	3.25	2.20	3.36

Anthracite Mines

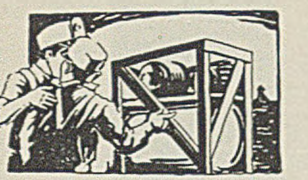
	July, 1932	June, 1932	July, 1931
Production, 1,000 tons	3,021	2,550	3,954
Fatalities	15	10	21
Death rate per 1,000,000 tons	4.97	3.92	5.31

Comparative fatality rates for 1932 and 1931 are given in the following table:

Fatalities and Death Rates at United States Coal Mines, by Causes*

Cause	Bituminous: Number Killed	Bituminous: Killed per 1,000,000 Tons	Anthracite: Number Killed	Anthracite: Killed per 1,000,000 Tons	Total: Number Killed	Total: Killed per 1,000,000 Tons
January - July, 1931						
All causes	629	2.864	235	6.620	864	3.387
Falls of roof and coal	370	1.685	126	3.549	496	1.945
Haulage	121	.551	29	.817	150	.588
Gas or dust explosions:						
Local explosions	5	.023	7	.197	12	.047
Major explosions	41	.187	5	.141	46	.180
Explosives	8	.036	16	.451	24	.094
Electricity	31	.141	2	.056	33	.129
Surface and miscellaneous	53	.241	50	1.409	103	.404
January - July, 1932						
All causes	462	2.844	130	4.782	592	3.122
Falls of roof and coal	252	1.551	71	2.611	323	1.704
Haulage	66	.406	21	.773	87	.459
Gas or dust explosions:						
Local explosions	8	.049	5	.184	13	.068
Major explosions	54	.333	...	.....	54	.285
Explosives	7	.043	8	.294	15	.079
Electricity	22	.136	4	.147	26	.137
Surface and miscellaneous	53	.326	21	.773	74	.390

* All figures are preliminary and subject to revision.



WHAT'S NEW
IN COAL-MINING EQUIPMENT

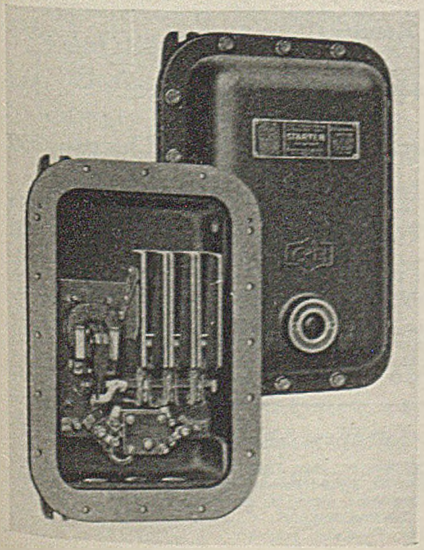
Crane Unit

Bucyrus-Erie Co., South Milwaukee. Wis., offers the improved "Loadmaster" crane unit with either Case or McCormick-Deering power for use either as a stationary revolving-boom crane, as a load-carrying crane, or as a tractor. The unit lifts and swings material to points where it is needed, and may be used for loading or unloading trucks and cars; in lifting rock, pipe and transformers into or out of manholes or trenches; and for material handling in maintenance and repair work. Either wheel or crawler mounting is available. Compactness, increased capacity, and extreme mobility are claimed for the unit.

Starters and Controllers

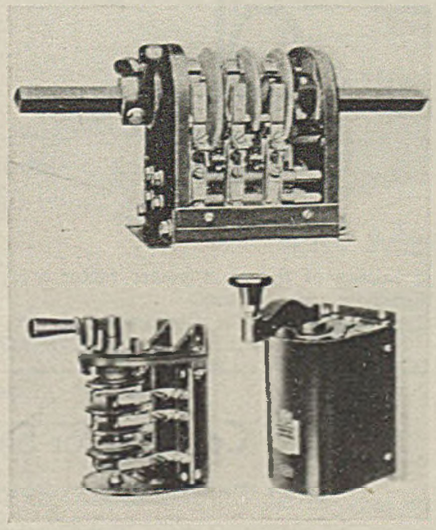
Cutler-Hammer, Inc., Milwaukee, Wis., announces a new, explosion proof, across-the-line type a.c. automatic starter designed in accordance with the specifications of the Underwriters' Laboratories for Class 1, Group D hazardous locations. The new starter is of the air-break type and there is no oil tank. The heavy cast-iron, explosion proof inclosure is designed, according to the company, to prevent any explosion which might occur within it from igniting the surrounding explosive atmosphere. The starter proper consists of a standard 3-pole magnetic contactor, with C-H thermal overload relays to protect the motor from burnout due to overloads. Inclosing case is of the "split" type, which, it is said, allows easy access to all parts.

Explosion-Proof Starter



Extra wide and accurately machined flanges are provided between the cover and case. These starters are designed in three sizes, for motors up to 30 hp., 220 volts; and 50 hp., 440 or 550 volts.

A new line of a.c. and d.c. across-the-line type reversing drum controllers, made in various combinations to meet varied requirements, has been developed by Cutler-Hammer. They are made in two- or three-pole types with radial or rope lever operating mechanism, self-centering or



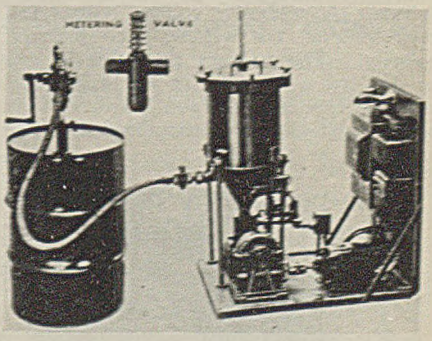
A.C. and D.C. Controllers

non-self-centering mechanism, and with or without either main-line limit switch protection or pilot circuit interlocks. Construction features emphasized by the company include: easy operation; small and compact design; light weight; sturdy drum construction; easily removed, non-stubbing contact fingers; slot-type mounting holes, ease of changing from self-centering to non-self-centering; and shaft extension of 6 in. beyond both ends of drum when rope level drive is furnished. The types which have pilot circuit interlocks can be used as reversing switches in conjunction with separate automatic starters and as magnetic contactors to provide limit switch selection in either direction.

Cutler-Hammer also has developed a new line of automatic and semi-automatic starters for synchronous motors. Important in the operation of these new starters according to the company, is a frequency responsive relay which functions in connection with an adjustable time delay thermal overload relay. In the case of either heavy overload, reduced line voltage, failure of motor field, or loss of d.c. excitation, the frequency relay disconnects the field switch and permits the motor to operate as a squirrel-cage motor for a period of about 30 seconds, depending upon the setting of the thermal overload relay. Should normal conditions return within the time adjusted for, the motor will resynchronize and continue in operation; otherwise, it will be disconnected from the line. This frequency relay also controls the field excitation automatically and on the reduced voltage automatic type it governs the transfer from low starting voltage to full voltage. These new starters are made in sizes from 25 to 600 hp. for 220, 440, 550 and 2,200 volts.

Mechanical Greaser

Hills-McCanna Co., Chicago, offers a new mechanical greaser, employing a single feed line, for application of light greases and heavy oils at regularly lubricated points. The main unit is placed in a convenient position, and a single line is run to the farthest greasing point. Branch lines are taken off to intermediate points. An independent measuring valve at each lubrication points allows the application of only the predetermined quantity of lubricant, regardless of line pressure. In

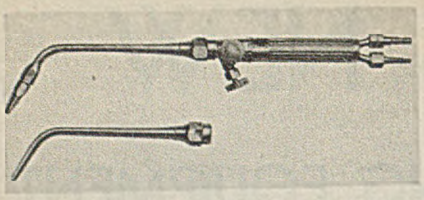


Hills-McCanna Lubricator

addition, the company says, pressure is applied to the line only when lubricating is done. Motor-driven, mechanically operated or manual types are available.

Welding Auxiliaries

Linde Air Products Co., New York City, announces a new Oxweld Type W-22 welding blowpipe with oxygen and acetylene valves located in front of the handle, so that easy adjustment of flame can be made while the blowpipe is in operation. A ball-type acetylene valve is another feature said to eliminate difficulties from carbon deposition in the valves. Type W-22 blowpipe can be used with the fol-



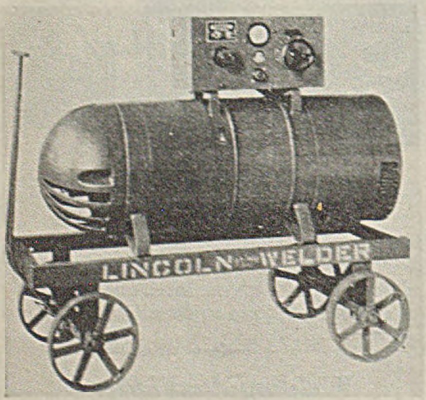
Oxweld Type W-22 Blowpipe

lowing equipment: Type W-17 one-piece and detachable welding heads; Type CW-17 cutting attachment; W-17 to W-15 adapters; and extra-long Type W-17 welding heads.

Linde Air Products Co. also offers the Oxweld Type R-48 oxygen regulator and the Type R-49 acetylene regulator as new equipment. These new regulators, the company states, have been designed for lighter duty, particularly in sheet welding, and include a new type of safety release. Type R-48 takes $\frac{1}{4}$-in. hose and Type R-49 takes $\frac{3}{8}$-in. hose. Other hose connections can be supplied.

Welding and Electrical Equipment

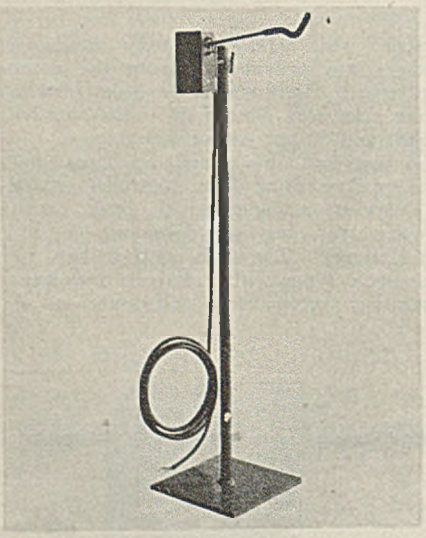
Lincoln Electric Co., Cleveland, Ohio, offers a new 40-volt "Shield-Arc" welder which, it declares, gives more weld deposit per hour, faster welding per kilowatt-hour, and lower cost in unit welding. Uniformity in welding current also is claimed, allowing the use of a higher average current for a given size of rod, with consequent increase in metal deposition and welding speed. The higher voltage permits efficient welding with newly developed electrodes, and offers improved operating characteristics when using bare or washed electrodes. Careful design, it is stated, has allowed the elimination of a stabilizer or kick transformer. Dual control permits independent regulation of current and voltage. A reversible voltage control has been installed for welding with reversed polarity. The welders are built in a.c. or d.c. types, 300, 400 or 600 amp. Removable running gear and drawbar allow easy changing to stationary models.



Lincoln Welder

A wire feeding head which allows automatic arc welding with the "Shield-Arc" process also has been developed by the Lincoln Electric Co. Full automatic control of the arc is claimed, thus maintaining constant arc temperatures. Means are provided for varying the travel of the head. Very high speed operation on either butt, fillet, or building-up welding is stressed by the company.

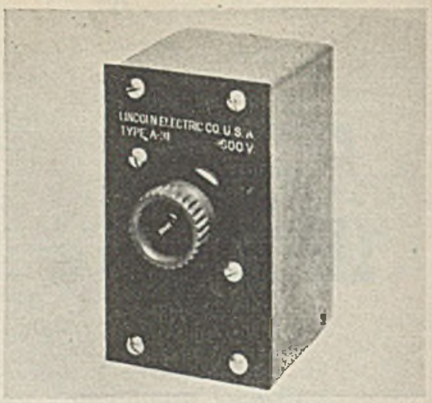
A new electrode holder stand, known as the "Power Saver," which automatically shuts down the welder one minute after the holder is placed on the stand, is another product of the Lincoln Electric Co. When the hook on the stand is depressed by the holder, a special timing device is actuated. This timing device shuts down the welder at the end of a minute. Savings in power



Lincoln "Power-Saver"

and raising of the plant power factor are claimed by the company.

Lincoln Electric Co. also announces the



A-31 Safety Pushbutton

A-31 safety pushbutton, designed with the "Start" button inside the "Stop" button. Safety is emphasized by the company. The "Stop" button can be operated from any angle by striking the front of the box, but the "Start" button can be operated only with the finger. The "Stop" button also can be locked on the "Off" position, and heavy springs prevent accidental operation of either button when not locked. Control circuits up to 600 volts can be handled, the company says, and the box need not be taken apart for wiring.

Another Lincoln product is the new automatic time delay switch, which the company declares is not affected by temperature changes or variations in operating conditions. The switch operates through the slow movement of mercury from one chamber to another, and provides for time delays of from 2 to 20 seconds.

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